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Wastewater Treatment Facilities
Little Rock (Adams Field), Arkansas

(U.S.) Environmental Protection Agency
Dallas, TX

Oct 81

U.S. Department of Commerce
National Technical Information Service
NTIS.

United States
Environmental Protection
Agency

Region 6
1201 Elm Street
Dallas TX 75270

EPA 906/9-81-005
October 1981

PB82-124116

Water

EPA

Environmental Impact Statement

Draft

Wastewater Treatment Facilities Little Rock (Adams Field), Arkansas

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This EIS has been prepared concurrently with the 201 facilities plan for the Adams Field/Little Maumelle Planning area. EPA's preferred alternative is to expand the Adams Field wastewater treatment plant, to construct an additional interceptor along Fourche Creek, and continue the use of septic tank systems on sites with suitable soils in the Little Maumelle Valley.

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1201 Elm Street
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October 1981

Water

EPA

Environmental Impact Statement

Draft

Wastewater Treatment Facilities Little Rock (Adams Field), Arkansas

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

September 18, 1981

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS AND OFFICIALS:

The city of Little Rock has received a planning grant (C-050490-1) pursuant to Section 201 of the Clean Water Act from the U.S. Environmental Protection Agency (EPA), Region 6, to plan for the upgrading of existing wastewater treatment facilities. EPA determined that awarding additional grants for detailed design and construction of any facilities represented a major action significantly affecting the quality of the human environment, and has prepared this Environmental Impact Statement (EIS).

Comments on the draft EIS should be sent to Mr. Clinton B. Spotts, Regional EIS Coordinator, EPA, Region 6, 1201 Elm Street, Dallas, Texas 75270. Substantive comments on the draft statement will be considered in the preparation of the final statement.

It is requested that comments on the draft EIS be submitted within 45 days of the publication in the Federal Register of the Notice of Availability of the EIS by the U.S. Environmental Protection Agency, Office of Federal Activities.

A public hearing will be held on the draft EIS at the University of Arkansas at Little Rock on November 12, 1981, at 7:30 p.m. in Conference Room 517B on the 5th floor of the Library, located at 33rd and University, Little Rock, Arkansas 72204.

It should be noted that if changes to the proposed project and draft EIS are minor, the final EIS will consist primarily of: 1) a summary; 2) pages with modifications, additions and/or deletions as necessitated by the coordination and review process; and 3) a new coordination section containing comment letters received on the draft statement with EPA's responses to those comments. Therefore, the draft EIS should be retained since it, along with the final EIS, will provide full analysis of the environmental issues. The final statement will be sent only to agencies and interested parties who request a copy or make substantive comments on the draft.

Sincerely,

Frances E. Phillips

Frances E. Phillips
Acting Regional Administrator

DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR
WASTEWATER TREATMENT FACILITIES
LITTLE ROCK (ADAMS FIELD), ARKANSAS
GRANT NO. C-050490-1

RESPONSIBLE AGENCY: U.S. Environmental Protection Agency, Region 6

ACTION BEING CONSIDERED: Possible awarding of design and construction funds for wastewater treatment facilities in Little Rock, Arkansas

COOPERATING AGENCIES: None

CONTACT FOR FURTHER INFORMATION:
Clinton B. Spotts
Regional EIS Coordinator
U.S. Environmental Protection Agency,
Region 6
1201 Elm Street
Dallas, Texas 75270
Phone: Comm. (214) 767-2716
FTS 729-2716

ABSTRACT: This EIS has been prepared concurrently with the 201 facilities plan for the Adams Field/ Little Maumelle Facilities Planning Area. EPA's preferred alternative is to expand the Adams Field wastewater treatment plant, to construct an additional interceptor along Fourche Creek, and use septic tank systems on sites having suitable soils in the Little Maumelle Valley.

DATE COMMENTS DUE:

RESPONSIBLE OFFICIAL:

Frances E. Phillips
FRANCES E. PHILLIPS
ACTING REGIONAL ADMINISTRATOR

SUMMARY

The Little Rock Wastewater Utility has applied to the U.S. Environmental Protection Agency for a Construction Grant to help expand the treatment capacity of the Adams Field wastewater treatment plant (WWTP). The existing Adams Field WWTP is currently overloaded, both hydraulically and by solids. As a result, effluent permit limits are difficult to attain and the sludge disposal facilities are seriously overloaded.

The City of Little Rock is presently served by a single wastewater treatment plant at Adams Field, though a second facility known as the Fourche Treatment Plant, will begin construction shortly. The Little Maumelle Valley is partially served by the Adams Field WWTP and partially served by individual septic tanks. This area to the northwest of the city had been part of a previous EPA Step 1 Grant, but additional grants were denied. Because of the controversy, the Little Maumelle area has been added to the Adams Field WWTP service area responsibility.

A large number of alternatives have been considered, which have been reduced to 14 major alternatives. The relative merits of each alternative has been compared using a weighted matrix. The alternatives considered include:

Adams Field Alternatives

No Action: The no action alternative would utilize the existing treatment system which is now seriously overloaded. This would result in potential air pollution from the incinerators, odor, water quality degradation, stress on aquatic life in the Arkansas River, poor solid waste utilization, high energy use, and potential public health hazards.

Upgrade Liquid Treatment Facilities: Under this alternative, improvements would include additional pumps, primary settling basin, additional aeration basins, final settling basin, and construction of a 20 million gallon retention/equalization basin to handle peak flows. The estimated construction cost is $11,052,000. This would improve odor conditions and water quality. User fees would need to be raised slightly and energy consumption would continue. There would be no secondary impacts.

Fourche Creek Interceptor Alternatives: An additional interceptor has been proposed to increase flow capacity along the Fourche Creek interceptor route. Two alternatives were considered; gravity line and force main. Only one route was proposed which traverses a floodplain and wetlands area known as the Fourche Bottoms. The gravity line alternative would have adverse impacts on soils, terrestrial biota, environmentally sensitive areas, and user fees. The force main would have lesser effects on terrestrial biota and sensitive areas, but would have additional adverse impacts on odor and energy.

Little Maumelle Alternatives:

No Action: The portion of the watershed currently being served by the Adams Field WWTP would retain service under all alternatives. The remaining areas would be allowed to grow with each homeowner responsible for individual wastewater treatment. Under this action, it is possible that inadequate septic tanks may be constructed in areas which are unsuitable for such systems. This would have adverse odor, soil erosion, and public health impacts.

Alternative 1: In this alternative, all additional residents would be served by approved septic tank-soil absorption systems and would only be allowed in areas which are suitable for septic tanks. This would eliminate potential odor and public health problems and would also limit future growth in the valley.

Alternative 2: In this alternative, residents on suitable soils would utilize standard septic tank-soil absorption systems, while residents on unsuitable soils would utilize septic tank-mound systems. User costs for the mound systems would be higher than that for standard septic tanks. No secondary growth is projected to result from this alternative.

Alternative 3: In this alternative, residents would utilize septic tank-soil absorption systems on suitable soils, while the remainder would utilize cluster systems with a common soil absorption system located on suitable soils. This would have soil erosion impacts, user fee increases and land use conversions. Slight secondary growth would be induced which would result in a small fiscal deficit for the school district.

Alternative 4: Under this alternative, all wastewater would be collected by a centralized collection system which would discharge by force main into the Arkansas River interceptor. Wastewater would be treated at the Adams Field WWTP. This alternative would have potential odor, soil erosion, water quality, user fee, and energy impacts. In addition, secondary growth is projected to be significant with additional air quality, biological, fiscal, public inconvenience, and land use impacts.

Each of the alternatives has been assessed by engineering and environmental criteria. The Facility Plan's proposed alternative is: upgrade liquid treatment, force main for the Fourche Creek interceptor, and Alternative 1 (septic tank-soil absorption systems) for the Little Maumelle Valley. The environmental analysis' preferred alternative is upgrade liquid treatment, force main for the Fourche Creek interceptor, and Alternative 1 (septic tank-soil absorption systems) for the Little Maumelle Valley.

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ADAMS FIELD WASTEWATER TREATMENT PLANT
LITTLE ROCK, ARKANSAS
DRAFT ENVIRONMENTAL IMPACT STATEMENT

I. INTRODUCTION

The Little Rock Wastewater Utility (LRWU) has requested a grant from the U.S. Environmental Protection Agency (EPA) to help expand the treatment capacity of the Adams Field Wastewater Treatment Plant. The Environmental Protection Agency has determined that the proposal requires an Environmental Impact Statement (EIS) under the provisions of the National Environmental Policy Act, and the EPA and LRWU have chosen to prepare the Environmental Impact Statement in a "piggy-back" approach, concurrent with facility planning by the LRWU's engineering consultants. The EPA has also determined that the EIS process will include a full-scale public participation program.

As a part of the environmental impact statement process, a number of interim reports, or working papers, have been prepared and disseminated to provide public information and comment. These working papers have been prepared at the completion of each major task or at major decision points within the environmental evaluation process. This was to allow public review and comment prior to initiating the next task. These working papers form an appendix to this Draft Environmental Impact Statement.

The Construction Grants Program

Under the auspices of Section 201 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), as amended by the Clean Water Act of 1977 (PL 95-217), the Environmental Protection Agency can

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assist in the construction of municipal sewage treatment works which are required to meet State and Federal water quality standards. This assistance is in the form of a grant for 75 percent of the eligible project costs, or 85 percent for innovative or alternative technology projects. The construction grants program is administered in a three step approach. Step 1 consists of performing the preliminary planning and engineering for the proposed treatment works. This step is commonly called the Facility Plan. Step 2 consists of preparing detailed engineering plans and specifications for the proposed facilities. Step 3 funds are for the construction of the proposed facilities.

Section 102(2)(c) of the National Environmental Policy Act (PL 91-190) requires agencies to:

> "include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on -
>
> (i) The environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
>
> (iii) alternatives to the proposed action,
>
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
>
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

This provision provides the basis for preparing an environmental impact statement on significant actions of the Federal Government.

The Council on Environmental Quality has promulgated Regulations on Implementing National Environmental Policy Procedures (40 CFR 1500-1508), which required each Federal agency to develop their own regulations to implement the Act in accordance with CEQ regulations. The Environmental Protection Agency Regulations on Implementation of National Environmental Policy Act Procedures (40 CFR 6) includes criteria for determining when to prepare an Environmental Impact Statement (EIS). From the criteria, EPA determined that the potential for induced changes in industrial, commercial, agricultural or residential land use concentrations or distribution existed, and therefore required that an EIS be prepared.

II. PURPOSE AND NEED

Project History

The City of Little Rock is presently served by the Adams Field wastewater treatment plant near the Adams Field airport. A second treatment facility (Fourche) has been proposed to serve the south and southwest portions of the city and is to be located about 4 miles southeast of the present plant. The design of this plant is completed and construction has begun.

A third treatment plant was proposed to serve the residents of the Maumelle Valley, a rapidly growing area in Northwest Little Rock. The Facility Plan and Environmental Assessment on proposed wastewater treatment faclities in the Maumelle Valley were submitted in April 1977. Responding to local controversy in the Maumelle Valley area over the project, the Environmental Protection Agency determined that an environmental impact statement would be prepared. The draft EIS on the proposed Maumelle treatment plant was issued in December 1978 and recommended that the grant for treatment facilities be denied. It was determined that the proposal presented did not meet the requirements necessary for federal funding. The final EIS was issued in November 1979 and concluded that pollution problems did not exist in the Maumelle Valley and additional EPA 201 grants were denied. However, it did recognize the long range problem of wastewater planning in the valley and chose to add the Maumelle area to the planning area under consideration for the proposed Adams Field expansion grant request.

Concurrently with the review of the draft EIS on the proposed Maumelle facilities, the Little Rock - North Little Rock Regional Wastewater Management Plan was being prepared by Metroplan and the

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Little Rock District of the Corps of Engineers. When it became apparent that the Maumelle grant funds would be denied, a "Special Study" was initiated to examine the wastewater planning needs of the Adams Field and Little Maumelle service areas. A projection of population and wasteloads contributing to future flows into the Adams Field treatment plant was made and several alternative treatment plans were formulated for the Maumelle Valley, including package plants, septic tanks, service by a new treatment plant, and service by Adams Field. The "Special Study", released in January 1979, concluded that service of the Maumelle area by the Adams Field WWTP would be the most cost-effective alternative; however, these conclusions were not based on detailed environmental and engineering analyses and the report recommended further study as part of the Adams Field WWTP Facility Plan.

Problems

The existing Adams Field Wastewater Treatment Plant is capable of treating an average daily flow of 27 million gallons per day (MGD) to an effluent quality of 30 milligrams per liter (mg/l) of biochemical oxygen demand (BOD) and 30 mg/l of total suspended solids. Peak treatment capacity is estimated to be 44 MGD, based on the capacity of the low lift pump station. Sludge is disposed by vacuum filtration and incineration with an estimated capacity of less than 70,000 pounds per day.

During 1978 and 1979 the Adams Field Sewage Treatment Plant treated an annual average day flow of 28.5 MGD and produced an effluent that was discharged to the Arkansas River which contained on the average 55.5 mg/l of suspended solids and 24 mg/l biochemical oxygen demand (BOD). During the two years the average monthly flows varied from a low of 21.2

MGD to a high of 38.7 MGD. On the same basis suspended solids in the final effluent varied from a low of 19 mg/l to a high of 150 mg/l and the BOD varied from a low of 10 to a high of 50 mg/l. According to the National Pollutant Discharge Elimination System (NPDES) permit, the final effluent should not exceed 30 mg/l of suspended solids and 30 mg/l of BOD. The suspended solids in the plant effluent exceeded the NPDES permit requirements 75% of the time during 1978 and 1979, and the BOD exceeded permit requirements 33% of the time during the years. In addition, the plant currently produces approximately 100,000 lbs/day of residual solids, which is 43 percent more than the plant was designed to handle.

There are no known health problems associated with the use of septic tanks in the Little Maumelle Valley. The 208 plan did express concern over potential problems which might occur if development were to occur on unsuitable soils. A brief survey of septic tanks as part of the facility plan indicated that approximately 40 percent of the systems have had operational problems, but that these are a result of underdesigning rather than unsuitability. The 208 plan indicated several pockets of population density which could constitute substantial habitation under EPA regulations.

III. DESCRIPTION AND EVALUATION OF ALTERNATIVES

The EIS process is essentially a decision making tool to determine which possible alternative would provide the "best" solution to a specific problem or need. The Adams Field Facility Plan is being conducted as a "piggy-back EIS," in which the environmental impact statement is prepared in lieu of an environmental assessment, and concurrently with the Facility Plan. As such, the EIS is a planning tool for making decisions.

Alternatives Considered by the Applicant

There are numerous possible alternative types and arrangements of wastewater treatment service possible for the Adams Field and Little Maumelle service areas. One of the purposes of the piggy-back EIS is to environmentally screen these alternatives to a limited number of reasonable alternatives for more detailed study. Working Paper No. 2, Identification of Alternatives, outlined and described 64 alternative components of possible sewerage and treatment systems. As part of the discussion of these large number of alternatives, several were rejected from further consideration because of substantial economic, engineering or environmental problems associated with them. Of the remaining alternatives, 12 system alternatives were formulated for the Adams Field service area and 17 alternatives were formulated for the Little Maumelle area.

The 29 system alternatives were carried forward to the initial screening, performed as part of Working Paper No. 4. During the Scoping Process, the Citizens Advisory Committee identified 8 major issues which were of most importance in the analysis. These 8 parameters shown in Table 1, were used as the screening parameters against which the 29

Table 1

Major Impacts Used in Initial Screening of Alternatives

Primary Impacts	Secondary Impacts
Water Quality	Terrestrial Habitats
Odor	Economic Impacts
Public Health	Conformance to Land Use Plans
Aquatic Life	Resource & Energy Use

system alternatives were judged. The effect of each alternative was rated from highly adverse (-2) to highly beneficial (+2) against each of the screening parameters. Since all of the screening parameters were judged to have the same weight, the scores were added and each of the system alternatives were ranked in numerical order.

Concurrently with the Environmental Impact process, the Facility Plan was prepared covering a number of alternatives from an engineering and economic aspect. One alternative other than no action was considered for treatment of liquids at the Adams Field WWTP, and 17 alternative sludge treatment schemes were considered including an additional 4 locational configurations for the anaerobic digestor-sludge lagoon alternative. In addition, 13 alternatives were examined for servicing the Little Maumelle area. As part of the Facility Plan, a deficiency was identified in one of the major trunk lines along Fourche Creek. Therefore, two alternatives were considered to alleviate this problem. As part of the Facility Plan, each of the alternatives were ranked according to present worth of the construction and O&M costs.

Subsequent to the preparation of the Draft Facility Plan and Initial Screening of Alternatives, the Little Rock Wastewater Utility had the opportunity to proceed with a sludge disposal alteration at a cost considerably less than any alternative considered to date. The Little Rock Wastewater Utility chose to implement the sludge disposal plan at their own expense, thereby removing consideration of sludge from the Construction Grant application and the EIS.

Following completion of the Initial Screening of Alternatives and the Draft Facility Plan, the Little Rock Wastewater Utility narrowed the list of alternatives to be considered further. These alternatives are presented in Table 2.

The No-Action Alternative

In any decision making process, one alternative which is always available is the option of doing nothing, or "no-action". In the case of Little Rock's wastewater system, this would entail utilizing the existing facilities and not making any improvements other than normal operation and maintenance activities.

The existing treatment scheme is the complete mix activated sludge process. Facilities include bar screens, raw sewage pumps, grit chambers, primary clarifiers, activated sludge basins, final clarifiers, and a chlorine contact chamber (see Table 3). Sludge is gravity thickened, vacuum filtered, and then incinerated. In 1979, one of the activated sludge aeration basins was converted for use as a aerobic sludge digester to handle excess sludge which could not be handled by the incinerator.

The plant has a current design capacity of 27 million gallons per day and is based on an influent raw sewage quality of 250 mg/l of biochemical oxygen demand (BOD) and 250 mg/l of total suspended solids (TSS). The safe pumping capacity of the plant is 44 MGD, which can be

Table 2

Proposed Alternatives for Little Rock EIS

No Action

Adams Field Treatment Alternatives:

1. Upgrade Liquid Treatment Facilities

Fourche Creek Interceptor Alternatives:

1. Gravity
2. Force main with pumping station

Maumelle Alternatives:

No Action

1. Septic tank with limited growth
2. Half septic tanks and half mound systems
3. Half septic tanks and half cluster systems
4. Pump all of Little Maumelle wastewater to Arkansas interceptor

increased by surcharging the main interceptor sewer. The maximum hydraulic capacity of the plant is 55 MGD. The 1979 average daily flow to the plant was 30.7 MGD, which exceeded its design capacity. Peak flows in 1978 were reported to exceed the 55 MGD hydraulic capacity of the plant. In addition, recent records indicate that the influent suspended solids more nearly averages 300 mg/l.

The existing collection system consists of approximately 805 miles of gravity sewers, ranging in diameters from 6 to 60 inches and 10 miles of force main ranging in size from 4 to 30 inches. The Facility Plan indicates five known overflow sites in the system; however, corrective actions have been initiated already or are not required according to the

Table 3

Summary of Existing Wastewater Treatment Facilities at Adams Field WWTP

Liquid Treatment Facilities:

Bar Screens:

2 automatically cleaned bar screens
1 manually cleaned bar screen

Raw Sewage Pumps

2 - 6 MGD raw sewage pumps
1 - 8 MGD raw sewage pump
2 - 12 MGD raw sewage pumps
1 - 24 MGD raw sewage pump

Grit Removal

3 grit chambers

Primary Clarifiers

3 - 115 ft. diameter primary settling basin

Activated Sludge Basins

6 - 40 ft. by 160 ft. aeration basins

Final Clarifiers

3 - 145 ft. diameter final seetling basins

Chorine Contact Chamber

Sludge Treatment Facilities:

Gravity Thickeners
Vacuum Filters
Incinerators

Facility Plan. Figure 1 shows the current service areas of the Adams Field WWTP.

The Little Rock Wastewater Utility is currently constructing a new wastewater treatment plant, known as the Fourche Plant, which will divert a portion of the existing service area. However, the remaining service area's wastewater flow to the Adam's Field Plant is projected to increase to an average flow of 30.9 MGD by the year 2010. Peak flows are projected to reach 70 MGD.

The existing facilities have been analyzed by the Facility Planning consultant and each treatment process has been assessed for adequacy under the 2010 flow condition. The Facility Planning consultant has found that raw sewage pumps, primary clarifiers, aeration basins, final clarifiers, and sludge facilities will be inadequate under the projected flow. The Facility Planning consultant has also identified the existing Fourche Creek interceptor to be inadequate to handle increased flows projected by the year 2010.

Upgrade Existing Liquid Treatment Facilities: In light of the present and projected deficiencies of the wastewater treatment facilities, the Facility Planning consultant has proposed a number of improvements to the existing liquid treatment facilities. These improvements include replacing some of the raw wastewater pumps, constructing an additional 115 foot diameter primary settling basin, adding four additional aeration basins, constructing an additional 145 foot final settling basin, making improvements to the internal sludge pumps, and construction of a 20 million gallon retention/equalization basin to avoid overloading the outfall pipe (see Figure 2). The total estimated costs of these improvements would be $11,052,000.

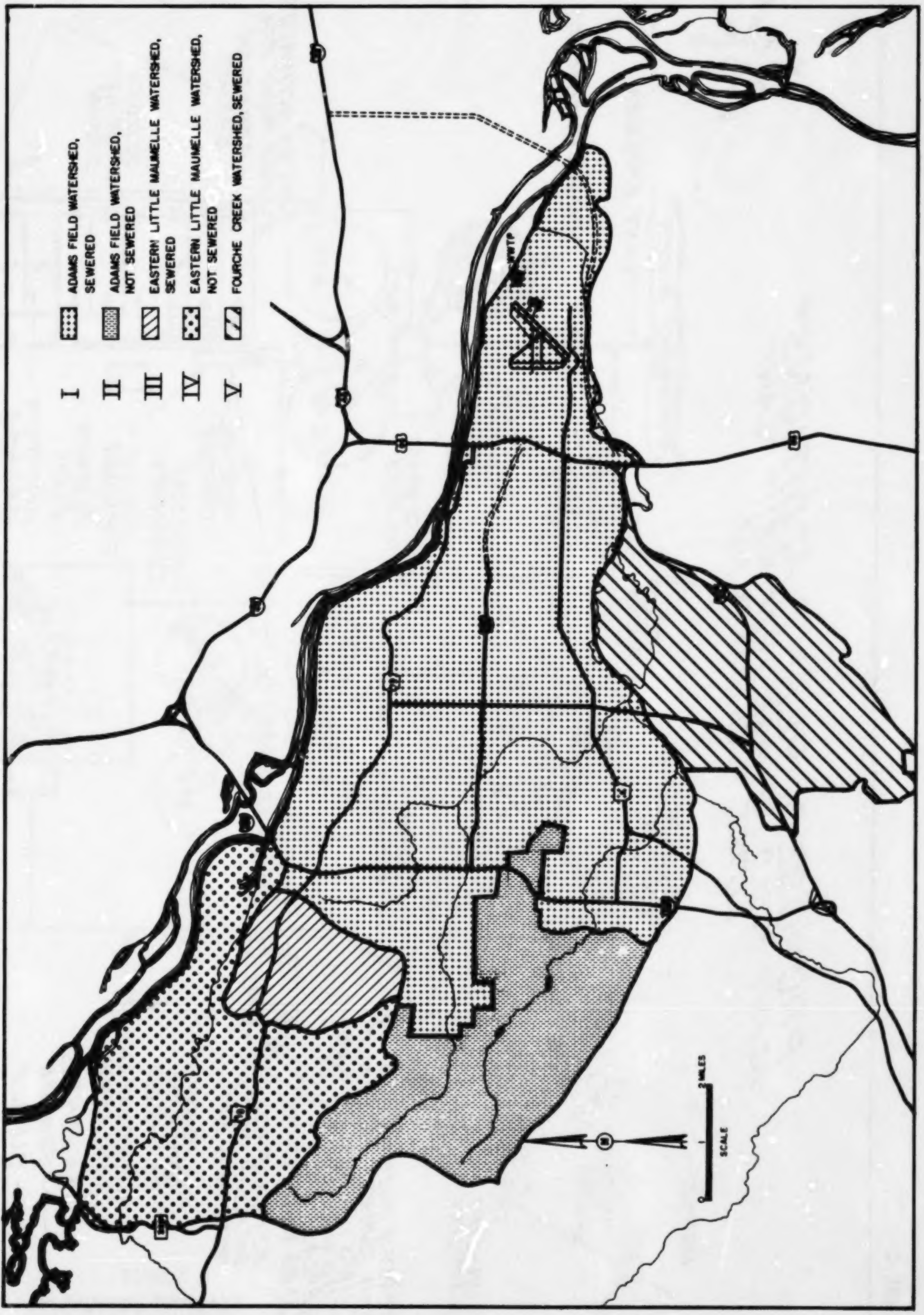
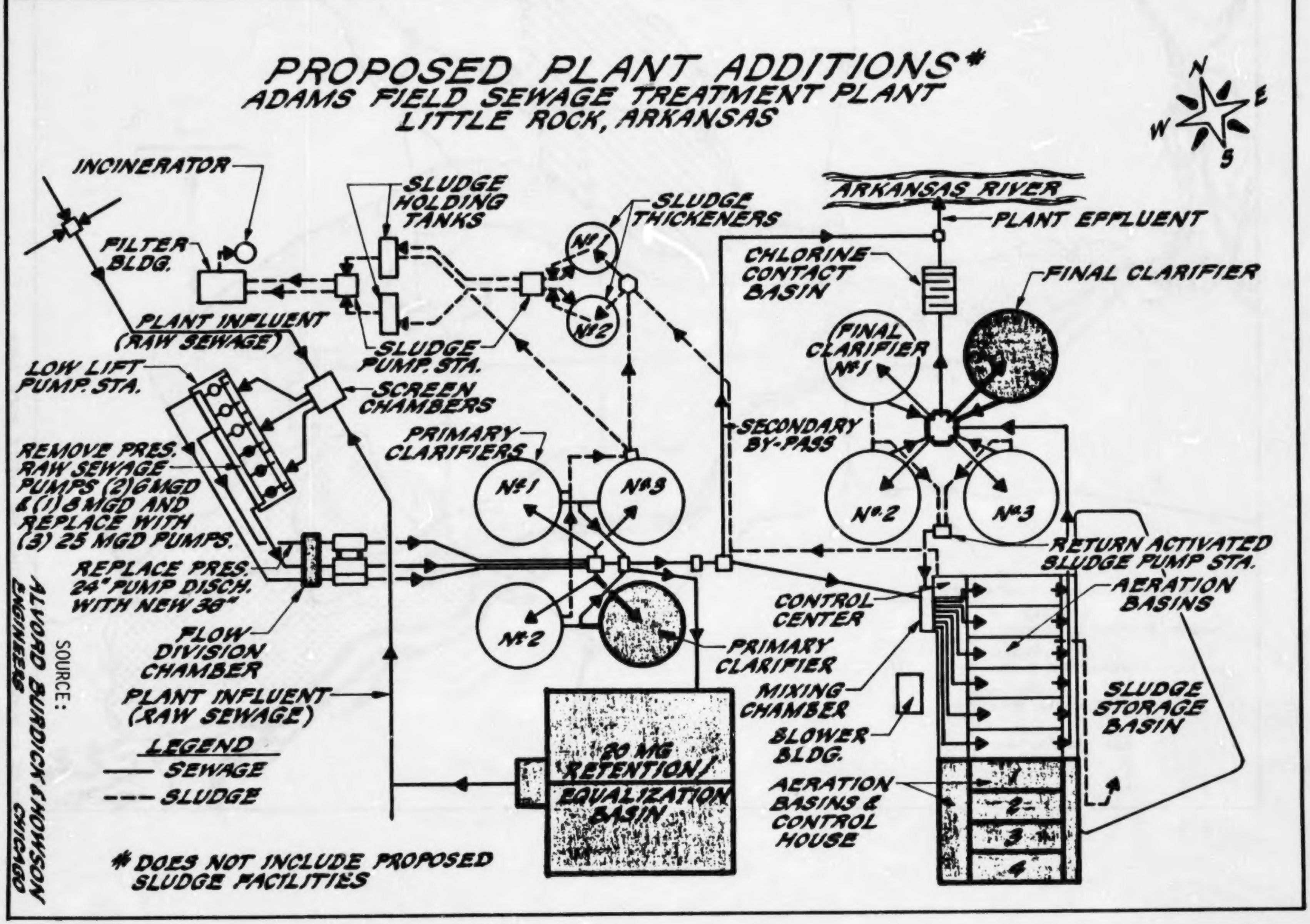

I ADAMS FIELD WATERSHED, SEWERED
II ADAMS FIELD WATERSHED, NOT SEWERED
III EASTERN LITTLE MAUMELLE WATERSHED, SEWERED
IV EASTERN LITTLE MAUMELLE WATERSHED, NOT SEWERED
V FOURCHE CREEK WATERSHED, SEWERED
WWTP
N
0
2 MILES
SCALE

FIGURE I. SERVICE AREAS WITHIN THE LITTLE ROCK AREA

FIGURE 2



PROPOSED PLANT ADDITIONS*
ADAMS FIELD SEWAGE TREATMENT PLANT
LITTLE ROCK, ARKANSAS

N
E
S
W
INCINERATOR
FILTER BLDG.
SLUDGE HOLDING TANKS
SLUDGE PUMP. STA.
SLUDGE THICKENERS
No. 1
No. 2
ARKANSAS RIVER
PLANT EFFLUENT
CHLORINE CONTACT BASIN
FINAL CLARIFIER
FINAL CLARIFIER No. 1
No. 2
No. 3
PLANT INFLUENT (RAW SEWAGE)
LOW LIFT PUMP. STA.
SCREEN CHAMBERS
SECONDARY BY-PASS
PRIMARY CLARIFIERS
No. 1
No. 2
No. 3
REMOVE PRES. RAW SEWAGE PUMPS (2) 6 MGD & (1) 8 MGD AND REPLACE WITH (3) 25 MGD PUMPS.
REPLACE PRES. 24" PUMP DISCH. WITH NEW 36"
FLOW DIVISION CHAMBER
RETURN ACTIVATED SLUDGE PUMP STA.
AERATION BASINS
CONTROL CENTER
PRIMARY CLARIFIER
MIXING CHAMBER
SLUDGE STORAGE BASIN
BLOWER BLDG.
AERATION BASINS & CONTROL HOUSE
1
2
3
4
PLANT INFLUENT (RAW SEWAGE)
20 MG RETENTION/ EQUALIZATION BASIN
LEGEND
—— SEWAGE
- - - SLUDGE

DOES NOT INCLUDE PROPOSED SLUDGE FACILITIES

SOURCE:
ALVORD BURDICK & HOWSON
ENGINEERS CHICAGO

Fourche Creek Interceptor Alternatives: The existing Fourche Creek interceptor has been determined to be inadequate to handle future flows. Two alternatives have been proposed to increase the capacity of this interceptor. The first is to construct a new 60-inch gravity sewer line from near University Avenue to the Airport along the north side of Fourche Creek (see Figure 3). The estimated construction cost would be $4,950,000 with an annual operation and maintenance (O&M) cost of $3,500.

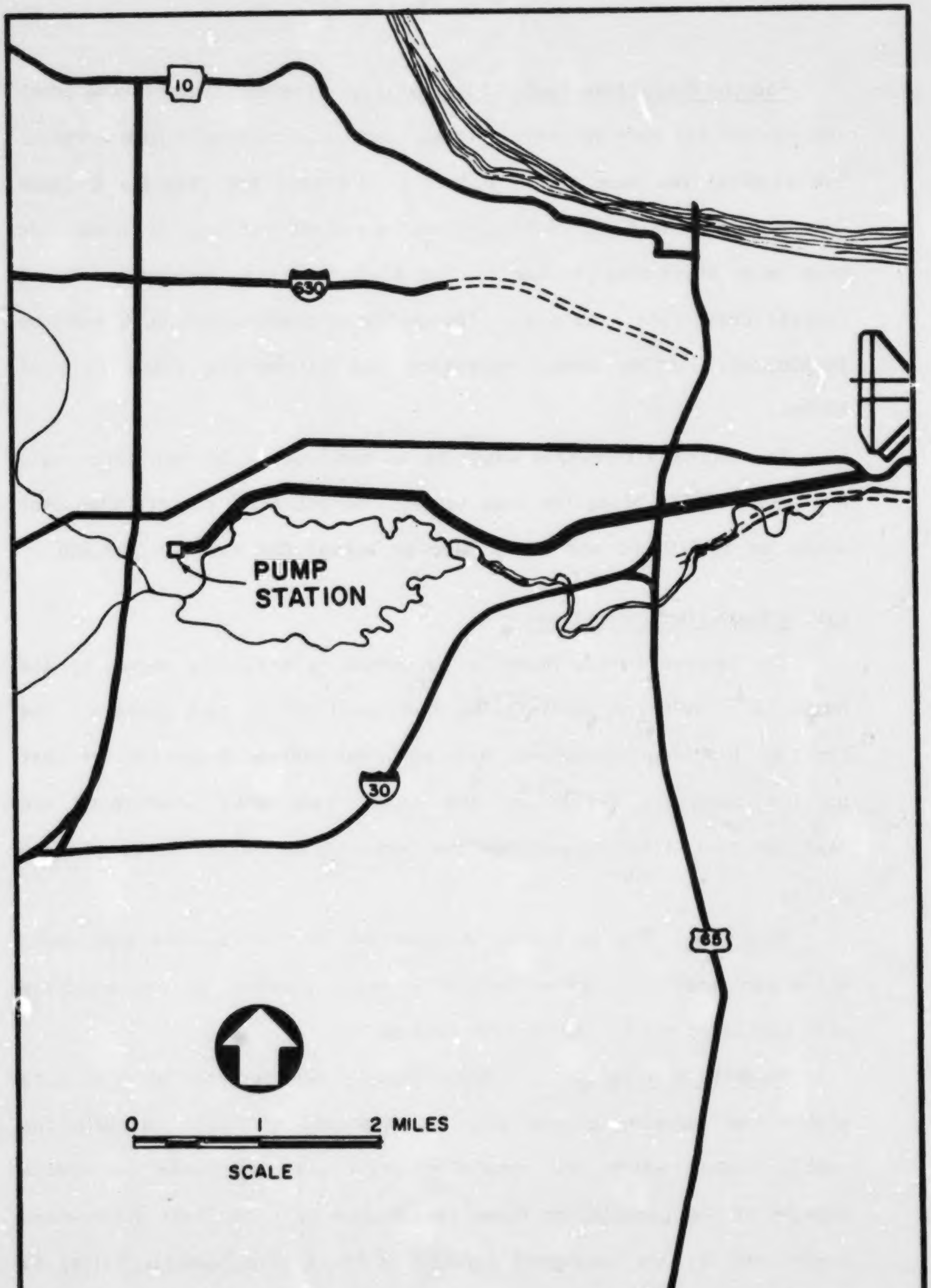
The second alternative would be to construct a 30-inch force main and pump station along the same route. The estimated construction cost would be $3,160,000 and would have an annual O&M cost of $47,300.

Little Maumelle Alternatives

The Eastern Little Maumelle watershed is partially served by the Adams Field WWTP and partially by individual septic tank systems. The Facility Planning consultants have proposed continued service for that portion currently served by the Taylor Loop Road interceptor and examined four alternatives for the remaining unsewered area, plus no action.

No Action: The No Action Alternative in the Maumelle area would allow continued residential growth to occur anywhere in the watershed with continued use of septic tank systems.

Maumelle Alternative 1: Approximately 45 percent of the area within the expected growth area is comprised of soils suitable for septic tanks, while the remaining soils are considered unsuitable because of low percolation rates (see Figure 4). The first alternative considered for the unsewered portion of the Little Maumelle Valley is continued use of septic tanks soil absorption systems. Since many soils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PUMP STATION
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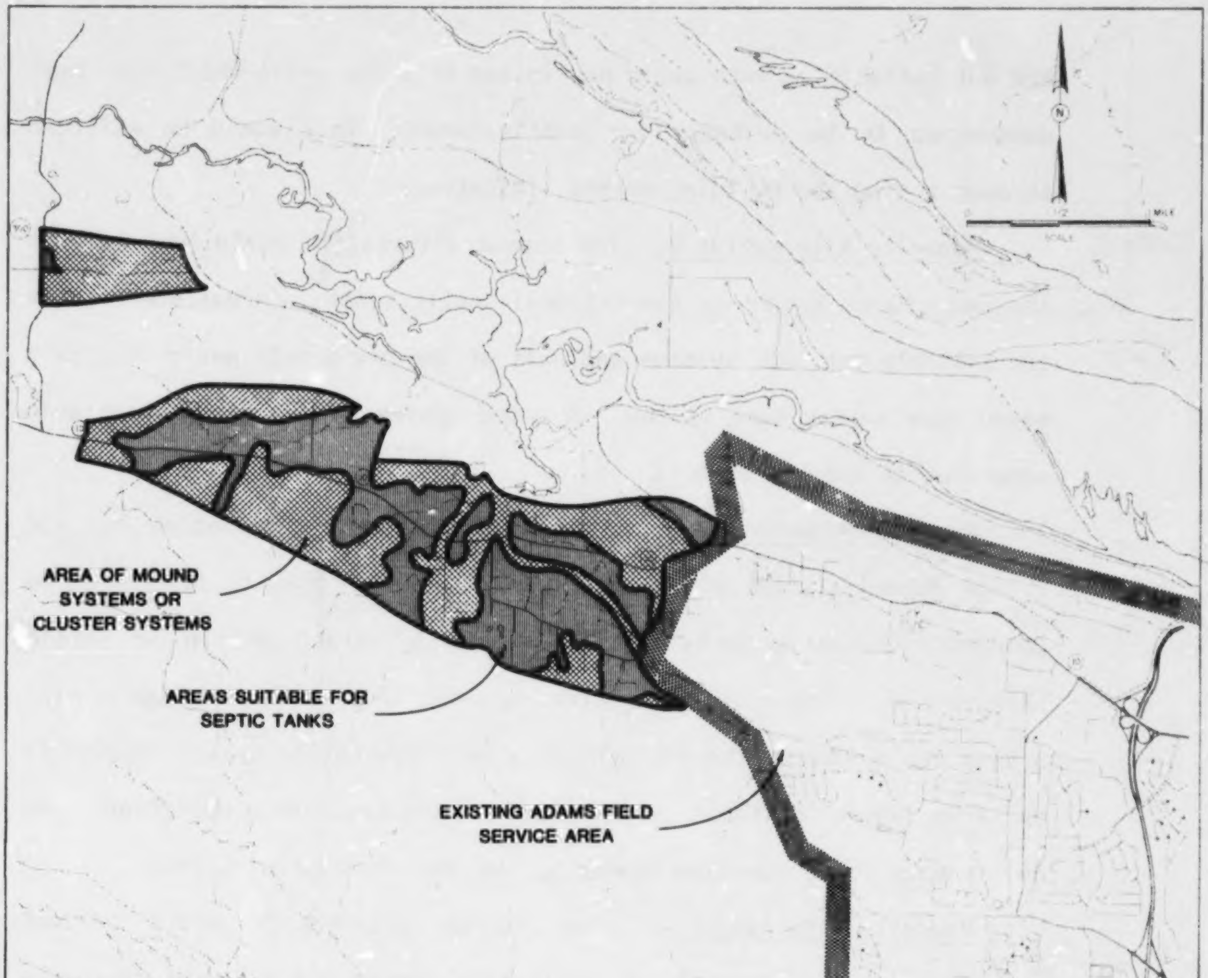
SCALE

FIGURE 3 PROPOSED ROUTE OF FOURCHE CREEK INTERCEPTOR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AREA OF MOUND SYSTEMS OR CLUSTER SYSTEMS
AREAS SUITABLE FOR SEPTIC TANKS
EXISTING ADAMS FIELD SERVICE AREA

FIGURE 4 LITTLE MAUMELLE INDIVIDUAL TREATMENT SERVICE AREAS

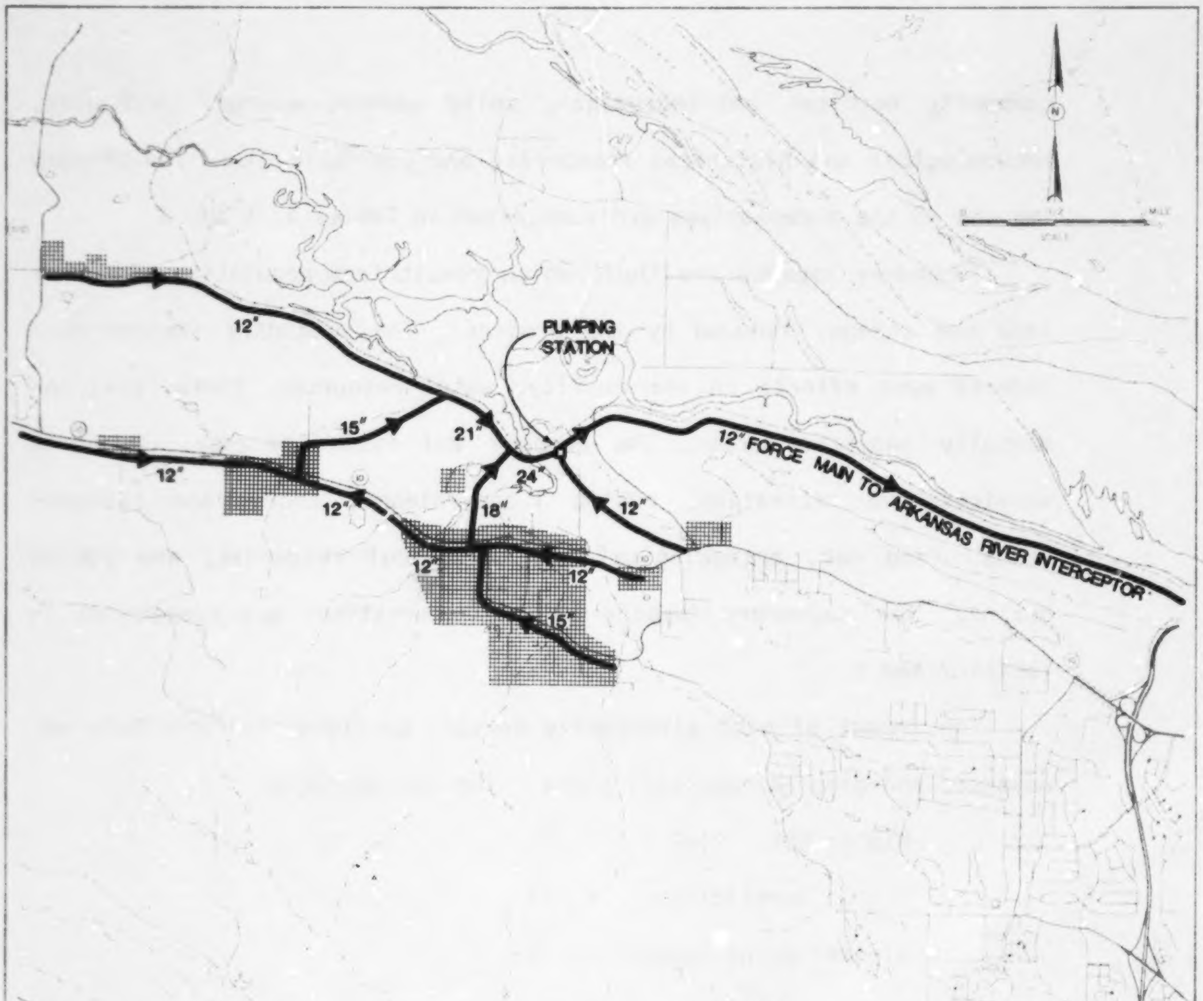
are not suitable, growth would be limited to those soils which have been determined to be suitable for septic tanks. This would be enforced through zoning and building permit limitations.

Maumelle Alternative 2: The second alternative would have half of the new growth served by conventional septic tanks in areas where soils are suitable for such systems and half of the new growth would utilize a mound type septic tank system. A mound system is currently acceptable under Health Department criteria.

Maumelle Alternative 3: The third treatment alternative for the Little Maumelle area would be for half of the area to be served by conventional septic tanks and half would be served by cluster septic tank systems. These cluster systems would collect effluent from several houses and discharge the effluent to a soil absorption system located in an area where suitable soils occur. Construction, operation, and maintenance costs would be shared by the individual households.

Maumelle Alternative 4: The fourth alternative would collect wastewater by a conventional collection system which would discharge into the Arkansas River interceptor and be treated by the Adams Field WWTP (see Figure 5). The estimated construction cost would be $4,152,750 with an annual O&M cost of $23,978.

Evaluation of the Applicants Alternative: The environmental effects of each of the alternatives were considered (see Working Paper No. 5). Primary impacts are those which result from the construction or direct operation of the proposed facilities. The primary impacts considered included effects on air quality, noise, odor, geologic elements, surface water quality, terrestrial biota, aquatic biota, environmentally sensitive areas, public inconvenience, direct employment, user fees,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PUMPING STATION
12"
15"
21"
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18"
12"
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12"
12"
15"
12" FORCE MAIN TO ARKANSAS RIVER INTERCEPTOR
LEGEND
PROPOSED INTERCEPTOR SEWERS
POPULATED AREAS

FIGURE 5 ARKANSAS INTERCEPTER COLLECTION SYSTEM ALTERNATIVE FOR LITTLE MAUMELLE community services and recreation, solid wastes, energy, land uses, archeological and historical resources, and public health. The primary impacts of the alternatives are summarized in Tables 4, 5 and 6.

Secondary impacts are those which result from population growth or land use changes induced by the project. The secondary impacts considered were effects on air quality, water resources, biota, environmentally sensitive areas, the economy and fiscal balance, community services and recreation, public inconvenience, energy and resource usage, land use, archeological and historical resources, and public health. The secondary impacts of the alternatives are summarized in Tables 7 and 8.

The impact of each alternative on each environmental attribute was assessed and given a numerical score. The ratings were:

Highly beneficial = +2
beneficial = +1
Minimal or no impact = 0
adverse = -1
Highly adverse = -2

Each of the ratings was used in a matrix to compare the relative merits of each of the alternatives. Each of the attributes had been assigned a weight (see Working Paper No. 1) and the weighted scores were used to identify the environmentally preferred alternative. The weighted scores and ranks of each of the alternatives are presented in Table 9.

Table 4

Comparison of Primary Impacts For The Proposed Alternatives-Adams Field Watershed

Resource	No Action Alternative	Upgrade Existing Liquid Treatment Facilities Alternative
Atmosphere		
a. Air Quality	Adverse; permit violations would most likely become significant due to sludge incineration	No Impact; no significant potential sources of particulate emissions are proposed
b. Noise	No Impact; Estimated noise levels are lower than the ambient levels of 68 Ldn at the plant boundary and 66 Ldn at the nearest residence	No impact; estimated noise levels are lower than the ambient levels of 68 Ldn at the plant boundary and 66 Ldn at the nearest residence
c. Odor	Highly Adverse; continued operation at Facility Overload level could represent a significant source of potential odor problems	Very beneficial; should improve system efficiency and thereby decrease odor potential
Geologic		
a. Soils	No Impact; will not affect soils	No Impact; no soil erosion hazard is evident
Water Resources		
a. Surface Water Quantity	No Impact; there will be no change in the relative volumes of plant discharge compared to the river flows	No Impact; there will be no change in relative volume of plant discharge compared to the river flows

Table 4 (Cont'd)

Resource	No Action Alternative	Upgrade Existing Liquid Treatment Facilities Alternative
Water Resources (Cont'd)		
b. Surface Water Quality	Adverse; surface water quality would continue to deteriorate as progress was not made towards compliance with the plant's NPDES permit	Beneficial; addition of new facilities and flow equalization should improve the quality of the effluent discharge to the Arkansas River
c. Drinking Water Supplies	No Impacts: both of the main sources of drinking water supplies are upstream	No Impact; drinking water supplies are upstream in all alternatives
Biological Elements		
a. Terrestrial Biota	No Impact; no additional construction	No Impact; Minimal impact; discharge quality will be improved but significant improvements in aquatic life would be minimal
c. Environmentally Sensitive Areas	No Impact; no sensitive areas affected	No Impact; no sensitive areas affected
Socio-Economics		
a. Public inconvenience	No Impact; existing conditions would not be altered	No Impact; normal operating conditions and air quality and traffic factors would not be affected
b. Direct Employment	No Impact; there will be no change in manpower needs	No Impact; there will be no change in manpower needs

Table 4 (Cont'd)

Resource	No Action Alternative	Upgrade Existing Liquid Treatment Facilities Alternative
c. User Fees	No Impact; user fees would not change	Adverse; this alternative would about increase the sewer rate by 5% (Increased customer charge of $0.52)
d. Community Services and Recreation	No Impact; will not change any recreational facilities nor affect the delivery of community services	No Impact; this alternative will not create a change in the delivery or availability of community services and recreational facilities
e. Solid Waste System Recycling	Very Adverse; the continued use of sludge incineration offers no	No impact; this alternative does not include any sludge disposal strategies
f. Energy	Very Adverse; present vacuum filters and incinerator are inefficient users of energy	Adverse; uses significant amount of power; however, is much more efficient than the existing system
g. Land Use	No Impact; will not alter existing land use	No Impact; will not alter existing land use
h. Archeological Historical	Impact not known	Impact not known
i. Public Health	Adverse; system is not adequately treating sewage which may adversely affect public health	No Impact; improvements should protect public health

Table 5

Primary Impacts of Fourche Creek Interceptor Alternatives

Resource	Gravity	Force Main & Pumping Station
Atmosphere		
a. Air Quality	No impact; no significant potential sources of particulate emission are proposed	No impact; no significant potential sources of particulate emissions are proposed
b. Noise	No impact; estimated Noise levels are lower than the ambient 68 Ldn at the plant boundary and 66 Ldn at the nearest residence	No impact; estimated noise levels are lower than the ambient levels of 68 Ldn at the plant boundary and 66 Ldn at the nearest residence
c. Odor	No impact; sewage is usually well enough oxidized in the sewer to prevent the formation and release of odorous hydrogen sulfide	Adverse; under anaerobic conditions in full flowing force mains, hydrogen sulfide formation may occur
Geologic		
a. Soils	Adverse; the potential exists for significant soil erosion problems	Adverse; The potential exists for significant soil erosion problems
Water Resources		
a. Surface Water Quantity	No impact	No impact
b. Surface Water Quality	No impact; does not discharge into waterways	No impact, does not discharge into waterways

Table 5 - (Cont'd)

	Gravity	Force Main & Pumping Station
Water Resources (Cont'd)		
c. Drinking Water Supplies	No impact; drinking water supplies are upstream of all alternatives	No impact; drinking water supplies are upstream of all alternatives
d. Groundwater Quality	No impact; involves no wastewater application to land	No impact; involves no wastewater application to land
Biological Elements		
a. Terrestrial Biota	Highly adverse; Would require clearance of 14 acres of wetlands and 24 acres of transitional and upland habitats	Highly adverse; Requires clearance of 7 acres of wetlands and 12 acres of transitional and upland habitats
b. Aquatic Biota	Minimal impact	Minimal impact
c. Environmentally Sensitive Areas	Highly adverse; requires clearance of 38 acres in wetlands scheduled for purchase by Corps for park	Slightly adverse; requires clearance of 19 acres in wetlands, flood plain and Corps purchase lands
Socio Economics		
a. Public Inconvenience	No impact; Would not alter normal operating conditions	No impact; would not alter normal operating conditions

Table 5 - (Cont'd)

Resource	Gravity	Force Main & Pumping Station
b. Direct Employment	No impact; there will be no change in manpower needs	No impact; there will be minor increase in manpower needs
c. User Fees	Adverse; user fees will increase by less than 5%. (Increased customer charge of $0.24)	Adverse; user fees will increase by less than 5% (Increased customer charge of $0.23)
d. Community Services	No impact; this alternative will affect existing or planned community services and recreational facilities	No impact; this alternative will not affect existing or planned community services and recreational facilities
e. Solid Waste System-Recycling	No impact; interceptors not a part of final sludge disposal procedures	No impact; interceptors not a part of final sludge disposal procedures
Energy	No impact; does not use energy to operate	Adverse; utilizes pumps to convey sludge thus representing an additional power cost to the treatment system
Land Use	No impact; will not affect existing land use	No impact; will not affect existing land use
Archeological Historical Resources	Impacts Unknown	Impacts Unknown
Public Health	No impact; assume will function adequately to protect public health	No impact; assume will function adequately to protect public health

Table 6

Comparison of Primary Impacts of the Proposed Alternatives - Little Maumelle Watershed

Resource	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS-50% ST/Mounds Alternative	50% ST/SAS 50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
Atmosphere					
a. Air Quality	No impact; will not involve air pollution sources	No impact; will not involve air pollution sources	No impact; will not involve air pollution sources	No impact; will not involve air pollution sources	No impact; will not involve air pollution sources
b. Noise	No impact; No significant sources of noise are associated with the alternative	No impact; No significant sources of noise are associated with the alternative	No impact; No significant sources of noise are associated with the alternative	No impact; No significant sources of noise are associated with the alternative	No impact; No significant sources of noise are associated with the alternative
c. Odors	Adverse; continues ST/SAS with inadequate controls on siting of systems therefore significant odor problems could occur	No impact would use soils not classified as unsuitable for soil absorption systems	No impact; Would use appropriate type systems for varying soil and water table conditions	No impact; Would use appropriate type systems for varying soil and water table conditions	Adverse; Full flowing force mains are potentially significant sources of odor problems
Geologic Elements					
	Adverse; proposes constructing ST/SAS on soils with potential soil erosion hazards	Adverse, proposes constructing ST/SAS on soils with potential soil erosion hazards	Adverse; Proposes construction ST/SAS on soils with potential soil erosion hazards	Adverse; proposes constructing ST/SAS on soils with potential soil erosion hazards	Highly Adverse; would affect greater area and be greater depth of soils with erosion hazard ratings

Table 6 - (Cont'd)

	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS-50% ST/Mounds Alternative	50% ST/SAS-50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
Water Resources					
a. Surface Water Quantity	No impact; will not change flows in Little Maumelle River	No impact; will not change flows in Little Maumelle River	No impact; will not change flows in Little Maumelle River	No impact; will not change flows in Little Maumelle River	No impact; will not change flows in Little Maumelle River
b. Surface Water Quality	No impact; will not cause significant discharges to surface waters	No impact; will not cause significant discharges to surface waters	No impact; will not cause significant discharges to surface waters	No impact; will not cause significant discharges to surface waters	Adverse impact; short-term but sewer construction will cause turbidity in River as a result of soil erosion
c. Drinking Water Supplies	No impact; drinking water supplies are upstream of work planned on the alternative	No impact; drinking water supplies are upstream of work planned on the alternative	No impact; drinking water supplies are upstream of work planned on the alternative	No impact; drinking water supplies are upstream of work planned on the alternative	No impact; drinking water supplies are upstream of work planned on the alternative
d. Groundwater Quality	No impact; there is no significant aquifer in the Little Maumelle Watershed	No impact; there is no significant aquifer in the Little Maumelle Watershed	No impact; there is no significant aquifer in the Little Maumelle Watershed	No impact; there is no significant aquifer in the Little Maumelle Watershed	No impact; there is no significant aquifer in the Little Maumelle Watershed
Biological Elements					
a. Terrestrial Biota	No impact; alternative will not require large clearance of native habitat	No impact; alternative will not require large clearance of native habitat	No impact; alternative will not require large clearance of native habitat	No impact; alternative will not require large clearance of native habitat	No impact; nearly all construction will be on existing road and railroad right-of-ways

Table 6 - (Cont'd)

	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS-50% ST/Mounds Alternative	50% ST/SAS-50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
b. Aquatic Biota	No impact; will not change existing water quality	No impact; will not change existing water quality	No impact; will not change existing water quality	No impact; will not change existing water quality	No impact; will not change existing water quality
c. Environmentally Sensitive Areas	No impact; will not effect environmentally sensitive areas	No impact; will not effect environmentally sensitive areas	No impact; will not effect environmentally sensitive areas	No impact; will not effect environmentally sensitive areas	No impact; will not effect environmentally sensitive areas
Socio Economics					
a. Public Inconvenience	No impact	No impact	No impact	No impact	No impact
b. Direct Employment	No impact; will not generate any new employment	No impact; will not generate any new employment	No impact; will not generate any new employment	No impact; will not generate any new employment	No impact; will not generate any new employment
c. User Fees	No impact; will not increase costs	No impact; will not increase costs	Highly Adverse; requires substantial initial investment	Highly Adverse; high initial capital investment and increased user fees	Adverse; increases user fees but requires no initial investment by the user
d. Community Services & Recreation	No impact; will not affect existing services or facilities	No impact; will not affect existing serfices or facilities	No impact; will not affect existing services or facilities	No impact; will not affect existing services or facilities	No impact; will not affect existing services or facilities
e. Solid Waste System-Recycling	No impact; solid waste collection and disposal will not be affected	No impact; solid waste collection and disposal will not be affected	No impact; solid waste collection and disposal will not be affected	No impact; solid waste collection and disposal will not be affected	No impact; solid waste collection and disposal will not be affected
f. Energy	No impact; no energy cost associated with this alternative	No impact; no energy cost associated with this alternative	Minimal impact; energy costs associated with the pumps are insignificant	Minimal impact; energy costs associated with the pumps are insignificant	Adverse; would create a significant energy cost where none existed

Table 6 - (Cont'd)

	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS- 50% ST/Mounds Alternative	50% ST/SAS- . 50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
g. Land Use	No impact; will not change existing land use	No impact; will not change existing land use	No impact; will not change existing land use	Adverse; requires 10 acres of land to be used only for septic tank absorption fields	No impact; will not change existing land use
h. Archaeological & Historical Resources	Impacts Unknown	Impacts Unknown	Impacts Unknown	Impacts Unknown	Impacts Unknown
i. Public Health	Adverse; present systems do not adequately treat sewage	No impact; it is assumed that systems operate adequately	No impact; it is assumed that systems operate adequately	No impact; it is assumed that systems operate adquately	No impact; it is assumed that systems operate adequately

Table 7

Secondary Impacts Fourche Creek Interceptor Alternatives

Resource	Gravity	Force Main & Pumping Station
Air Quality	No impact	No impact
Water Resources	No impact	No impact
Biological Elements		
a. Biota	Adverse; induced population growth will reduce forest habitat	Adverse; induced population growth will reduce forest habitat
b. Environmentally Sensitive Areas	No impact	No impact
Socio Economics		
a. Economy & Fiscal Balance	Beneficial; the cost of providing municipal services to the induced population will be less than revenues received through expanding the tax base	Beneficial; the cost of providing municipal goods and services to the population induced by this alternative will be less than revenues received through expanding the tax base
b. Community Services & Recreation	No impact	No impact
c. Public Inconvenience	No impact	No impact
d. Energy & Resource Usage	No impact	No impact

Table 7 - (Cont'd)

	Gravity	Force Main & Pumping Station
e. Land Use	Beneficial; conforms to land use plan	Beneficial; conforms to land use plan
f. Archaeological & Historical	Impacts unknown	Impacts unknown
g. Public Health	No impact	No impact

Table 8

Comparison of Secondary Impacts of the Proposed Alternatives

Little Maumelle Watershed

Resource	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS-50% ST/Mounds Alternative	50% ST/SAS 50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
Air Quality	No impact	No impact	No impact	No impact	Adverse; population growth create air quality problems through increased urbanization of area
Water Resources	No impact	No impact	No impact	No impact	No impact
Biological Elements					
a. Biota	No impact	No impact	No impact	No impact	No impact
b. Environmentally Sensitive Areas	No impact	No impact	No impact	No impact	No impact
Socio Economics					
a. Economy & Fiscal	No impact	No impact	No impact	Adverse; the cost of providing municipal goods and services to the population induced by this alternative exceeds revenues to be received through expanding the tax base	Adverse; the cost of providing municipal goods and services to the population induced by this alternative exceeds revenues to be received through expanding the tax base
b. Community Services and Recreation	No impact	No impact	No impact	No impact	No impact

Table 8 - (Cont'd)

	No Action Alternative	Septic Tanks/Soil Absorption Systems (ST/SAS)	50% ST/SAS-50% ST/Mounds Alternative	50% ST/SAS 50% ST/Cluster Systems Alternative	Centralized Collection Systems Alternative
c. Public Inconvenience	No impact	No impact	No impact	No impact	Adverse; Increased population may force changes in normal routine due to eased traffic volumes
d. Energy & Resource	No impact	No impact	No impact	No impact	No impact
e. Land Use	No impact	No impact	No impact	No impact	Adverse; does not conform to land use plan
f. Archeological & Historical Resources	No impact	No impact	No impact	No impact	Impacts Unknown
g. Public Health	No impact'	No impact	No impact	No impact	No impact

Table 9

Scores and Ranks of Major Alternatives

Alternative	Primary Score	Secondary Score	Total Score	Rank
Adams Field Alternatives				
No Action	-45	0	-45	2
Upgrade Liquid Treatment	+ 6	0	+ 6	1
Fourche Interceptor Alternative				
Fourche Creek-Gravity	-20	+ 7	-13	2
Fourche Creek-Force Main	-19	+ 7	-12	1
Little Maumelle Alternatives				
Little Maumelle-No Action	-10	0	-10	4
Little Maumelle-Septic Tank Controls	- 2	0	- 2	1
Little Maumelle-50% Septic Tanks, 50% Mound Systems	- 6	0	- 6	2
Little Maumelle-50% Septic Tanks, 50% Cluster Systems	- 7	0	- 7	3
Little Maumelle Collection System	-18	-20	-38	5

Alternatives Available to EPA: The Environmental Protection Agency has three alternative courses of action available to them. One would be to award the Step 2 and Step 3 grants to the Little Rock Wastewater Utility for detailed design and construction of the most cost effective and environmentally sound alternative. The second possible alternative available for EPA would be to award additional grants for the detailed design and construction of the most cost effective plan and require certain conditions to minimize adverse environmental impacts. Finally, EPA has the option of not awarding any additional grant monies for detailed design and construction of the treatment facilities.

Alternatives Available to Others: No other reasonable alternative actions by federal or other agencies have been considered in this EIS.

IV. ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES ON AFFECTED ENVIRONMENT

A. GEOLOGICAL ELEMENTS:

The eastern portion of the Adams Field watershed lies within the Mississippi Alluvial Plain section of the Coastal Plain Province within the Atlantic Plains Division. This area is generally flat, being formed by very deep alluvial sediments. The western portion of the watershed lies within the Fourche Mountains section of the Ouachita Mountains Province of the Interior Highlands. This area is characterized by major ridges separated by broad valleys. The topography ranges from flat to gentle slopes in the eastern portion near the treatment plant, to moderately hilly areas in the central portion, to steep slopes and mountains in the western portion. The most notable structural feature in the western portion of the watershed is the Panther Creek Fault which is evident in the Brodie Creek and Panther Creek stream courses. However, this fault is located outside the service area.

The Carnasaw - Mountainburg Association is the major soil association found in the central and western portions of the watershed. In the eastern section are the Amy-Rexor, Perry-Norwood, and Urban Land-Smithdale-Leadvale Associations. The Adams Field WWTP is underlain by the Keo-Urban Land Association (see Working Paper No. 3), while the South Fourche Plant site is underlain by the Bruno-Crevasse Association.

The Little Maumelle watershed lies within the Fourche Mountains, and is underlain by soils of the Carnasaw-Mountainburg, Sallisaw-Leadvale, Perry-Norwood, and Rilla-Keo Associations. The soils of the Carnasaw-Mountainburg Association, which almost pervade the study area, are rated very severe for their erosion hazard. The Sallisaw-Leadvale

Association, the second largest in the area, is also rated severe for its erosion hazard. The remaining two associations are rated moderate to none for soil erosion hazards, but occupy relatively minor sections of the study area.

The erosion hazard of the soils underlying the particular alternative sites was used as the basis for rating the impacts of the alternatives. No other geologic impacts are expected.

Adams Field Alternatives

No Action Alternative: The No Action Alternative would have no adverse impact on soil or geologic resources.

Upgrading Existing Liquid Treatment Facilities: No soil erosion hazard is associated with the Keo soil type which underlies the treatment plant site. No significant adverse impacts on soils would be expected.

Fourche Creek Interceptor Alternatives:

The pipeline routes would be constructed through Perry and Norwood soils with no erosion hazard, and Leadvale soils with a moderate erosion hazard rating. The potential exists for some significant soil erosion problems in the Leadvale soils unless adequate control measures (such as those in EPA's Program Requirement Memorandum 78-1) are implemented. These two alternatives are considered adverse for their potential adverse short-term impacts on geological elements.

Little Maumelle Alternatives:

No Action, Alternatives 1, 2, and 3: These alternatives all propose the construction of septic tank systems on various types in soils that have predominantly severe to very severe erosion hazard ratings.

The adverse impacts are likely to be moderate because of the relatively small areas and shallow construction involved in septic tank systems.

Alternative 4: This alternative proposes the use of a central gravity sewer collection system, and force mains and pumping stations. Construction work would affect more extensive areas of soils with severe to very severe erosion hazard ratings and to greater depths than for ST-SAS. This alternative is rated highly adverse for its impact on geological elements.

B. HYDROLOGICAL ELEMENTS

The Arkansas River is the major hydrologic feature within the study area. The river flows from northwest to southeast through the Little Rock area, before turning sharply to the south just downstream from the city. The average discharge over the 51-year period prior to 1978 was 40,950 cubic feet per second (cfs), while the average discharge during the five-year period 1971-1975 was 57,772 cfs. Since then the average discharge has declined with the 1976-1980 average being 29,078 cfs.

The Arkansas River drains an area of 158,030 square miles at this point, extending from its headwaters in the Rocky Mountains of Colorado. The flow is regulated by numerous upstream reservoirs and locks. The Arkansas River has been navigable to near Tulsa (Port Catoosa), Oklahoma since December 1970. The two major man-made features on the Arkansas River in the Study Area is Murray Lock and Dam (L&D No. 7) just upstream from Little Rock and David D. Terry Lock and Dam (L&D No. 6) at River navigation mile 108.1. A total of 10,214,662 tons were moved on barge traffic on the McClelland-Kerr River Navigation System in 1978, including bauxite, coal, lumber, steel, chemicals, grain and petroleum.

The majority of the study area is drained by Fourche Creek and its tributaries. Its total drainage area is approximately 170 square miles and discharges into the Arkansas River at mile 111.6. Rock Creek is the major tributary of Fourche Creek and drains most of the western half of the primary study area. Brodie Creek, also a tributary of Fourche Creek, forms the southern boundary of the primary study area in the west, while Fourche Creek itself forms the southern boundary for the remainder of the study area.

All of the tributaries of Fourche Creek have a median flow of less than 5 cfs, while Fourche Creek itself has a greater flow. The tributary creeks generally have a steep slope and fast runoff while the Fourche Creek flattens out in what is known as the Fourche Bottoms. As a result, the tributary streams provide rapid runoff into the Fourche Bottoms, which acts as a reservoir by retaining water before discharge into the Arkansas River.

The other major drainage system in the study area is the Little Maumelle River in the northwest part of the Study area. The Little Maumelle River drains approximately 78.6 square miles in western Pulaski County. It has steep stream slopes in its upper reaches, until it approaches the Arkansas River. Murray Lock and Dam on the Arkansas River results in backwaters in the Little Maumelle River.

There is little hydrologic data available for the Little Maumelle River. The only known partial records are 7 discharge measurements and two observations of no flow made during the period 1964-1967. Most of the measurements were made at flow extremes, and do not accurately reflect normal conditions in the River. High water measurements ranged from 1,350 cfs to 3,600 cfs, while low water flows ranged from 0 to 16.4

cfs. The 7-day, 2-year low flow is estimated at less than 0.1 cfs.

Since the construction of the navigation and flood control projects on the Arkansas River, major flooding along the river has been moderated. The last major flood on the Arkansas River was in November 1973 with a peak discharge of 304,000 cfs and a flood stage of 41 feet. The tributary streams of the Fourche Creek are also prone to flooding from heavy precipitation and rapid runoff. In September 1978, a particularly devestating flood occurred when up to 12.25 inches of rain fell over a period of 6 hours in western and southwestern Little Rock. Eight lives were lost along Rock Creek from flash flooding and numerous houses were damaged or destroyed.

Little Rock Water Utility provides service to Little Rock and to suburban areas. The raw water comes from two man-made lakes, Lake Winona and Lake Maumelle, and is treated at two municipal water treatment plants. Lake Winona, located 34 miles to the west in the Ouachita National Forest in Saline County, is the primary water source providing approximately 24 million gallons per day (MGD) to the Little Rock area and the remainder of water requirements are pumped from Lake Maumelle, the secondary water source located 12 miles west of Little Rock. Lake Winona has a storage capacity of 15 billion gallons and a firm yield of 25 MGD while Lake Maumelle has a 68 billion gallon storage capacity and a firm yield of 52 MGD. The total system has a present capacity of 73 MGD while the average daily use of water produced is 43.6 MGD.

Groundwater: Because of compaction of the geologic formations in the Fourche Mountains area, the porosity is low and groundwater yields are low in the interior highlands western portion of the study area. Locally, however, fracturing may result in higher yields. In the

Coastal Plain, however, several aquifer units are present, providing well yields of up to 350 gpm. The alluvium along the Arkansas River is also a good source of groundwater. Because the Little Rock Water Utility provides water to most of the county, use of well water for domestic use is limited. The most extensive use of groundwater is presently for irrigation. There appears to be potential for future development of groundwater in the Arkansas alluvium and Coastal Plain, but to date this development has not yet occurred.

Water Quality: Through Regulation No. 2, the Arkansas Department of Pollution Control and Ecology has developed and promulgated water quality standards for surface waters within the State. As part of the Statewide 208 Water Quality Management Plan, a review was made of the water quality standards. However, no changes were proposed which would affect the streams within the study area.

Water quality has been measured consistently on the main stem of the Arkansas River for many years; however, very little data is available for the tributary streams. The Department of Pollution Control and Ecology has classified the entire stretch of the Arkansas River from Murray Lock and Dam to Pine Bluff as violating standards for fecal coliforms and phosphorus, thereby precluding primary contact recreation. It is quite apparent that the coliform contamination occurs in the Little Rock area. The mean fecal coliform concentration at Murray Lock and Dam (1974-1979) was 114/100 ml, while the mean concentration at David D. Terry L&D (1976-1980) was 2,353/100 ml. The mean for the six years prior was even higher. Major potential sources for fecal coliforms between these two sampling points are four municipal wastewater treatment plants (including the Adams Field WWTP), a number of industrial discharges, discharge of Fourche Creek, and urban runoff. Degradation of water quality between the two stations is apparent, but the most striking is the increase in biochemical oxygen demand (BOD), suspended solids, total phosphates, and fecal coliforms.

Water quality data within the Fourche Creek Basin has been limited to intensive surveys conducted by the Arkansas Department of Pollution Control and Ecology and by the University of Arkansas Little Rock as part of the 208 Water Quality Management Plan. In general, water quality in Fourche Creek violates phosphorus, dissolved oxygen, and fecal coliform criteria. High phosphorus and low dissolved oxygen is consistent with the slow sluggish nature of the Fourche Bottoms. Fecal coliform violations, as well as high values for cadmium, manganese, oil and grease, and pH, generally occur during high flow conditions. All of these conditions can be attributed to urban runoff; i.e., during a rainfall event the precipitation washes accumulation of dirt and oil and grease from streets and other impervious surfaces into Fourche Creek. High fecal coliforms could also be the result of sanitary sewer overflows.

There has apparently never been any water quality data collected within the Little Maumelle River watershed. It can be assumed that water quality is generally excellent in the upstream reaches of the river. A visual inspection of the river at Highway 10 showed a slow moving stream with considerable suspended algae.

The Arkansas Department of Pollution Control & Ecology is responsible for determining assimilative capacities and wasteload allocations for streams in Arkansas. A computer model for the Arkansas River showed that the river could assimilate all projected wasteloads. However, this was computed under higher flow conditions. A simplified water quality modeling method was used on tributary streams. This analysis indicated an assimilative capacity of 16 lbs. of BOD per day for the Little Maumelle River and 73 lbs. of BOD/day for Fourche Creek. The Department of Pollution Control & Ecology established a policy that wastewater discharge permits would be 30 mg/l BOD and 30 mg/l total suspended solids (TSS) for effluent limited streams and 10 mg/l BOD and 15 mg/l TSS for water quality limited streams. However, some streams of recreational value were also assigned the 10/15 limitations. This limit was assigned to the Little Maumelle River and to Fourche Creek, while discharge permits on the Arkansas River have been written for 30/30.

The study area lies within the planning jurisdiction of Metroplan, which is responsible for Areawide Water Quality Management Planning under Section 208 of Public Law 92-500. The initial plan has been prepared and recommends that the Little Maumelle area be served by the Adams Field wastewater treatment plant. Other planning activities related to water resources include participation in the National Urban Runoff Program and the possible designation of the Little Maumelle River as part of the Arkansas Natural and Scenic Rivers System. This project is still in the feasibility study phase.

The Adams Field treatment plant currently discharges an average of 31 MGD (48 cfs) of effluent to the Arkansas River. This represents approximately 0.08 percent of the average flow of the river.

Adams Field Alternatives:

No Action: Surface water quality in the Arkansas River would continue to deteriorate. Progress would not be made towards compliance with the plant's NPDES permit if this alternative is implemented. Therefore, this alternative is rated adverse on water quality. There would be no beneficial or adverse impact on water quantities since the plant discharge is small compared to flow in the Arkansas River.

Continuing use of the existing wastewater disposal facilities would have no adverse impact on groundwater quality. There would be no adverse impact on drinking water supplies.

Upgrading Existing Liquid Treatment Facilities: The addition of flow equalization to maintain flows through the existing plant below the design capacity would improve the quality of the effluent discharged to the Arkansas River. New settling tanks and aeration basins as well as fine bubble diffusers should also improve the effluent quality. These improvements should help to produce an effluent that complies with the NPDES permit. The plant discharges are relatively small in comparison to the flows of the Arkansas River and its assimilative capacity; therefore, the observed water quality improvements are expected to be slightly beneficial. No adverse or beneficial impact on water quantities would result. The upgrading of the existing liquid treatment facilities would result in no adverse impact on groundwater quality or drinking water supplies.

Fourche Creek Interceptor Alternatives:

Soil eroded during construction of these interceptors could possibly be washed into Fourche Creek. The resulting adverse impact would be short-term and insignificant in magnitude because of the existing poor water quality of the creek. No significant direct impacts on water quality would be expected from the operation of either of the alternatives since they do not discharge into waterways. The proposed interceptors involve no wastewater application to land and would have no adverse impact on groundwater quality.

Little Maumelle Alternatives:

No Action, Alternatives 1, 2, and 3: Septic tank discharges would have relatively little impact on the flows in the Little Maumelle River. None of these alternatives, which are based on soil absorption systems, would be the cause of significant discharges to surface waters. Therefore, they would have no significant adverse impact on surface water quality. Since both sources of drinking water are upstream, no adverse impacts on drinking water supplies would occur.

Alternative 4: The effluent discharge of 0.4 MGD from this alternative represents an insignificant portion of the current and design year discharge of the Adams Field WWTP. The effluent discharged from the Adams Field WWTP is approximately 0.08 percent of the average flow of the Arkansas River. This alternative would result in no significant adverse impact on water quantity of the Arkansas River.

Implementation of this alternative with extensive sewer construction would cause localized construction-related turbidity in the Little Maumelle River as a result of soil erosion (see impacts on geologic elements). Therefore, it is considered adverse for a potentially significant but short-term impact. No significant long-term adverse impact from the 0.4 MGD effluent discharge to the Arkansas River would be expected.

C. CLIMATOLOGICAL ELEMENTS

The Study Area lies within the Central Arkansas Interstate Air

Quality Control Region. The State of Arkansas has adopted the National Air Quality Standards for statewide air quality control. Pulaski County, of which the Study Area is a part, is classified by the Arkansas Plan of Implementation as meeting all pollutant criteria except particulates and photochemical oxidants.

A summary of the ambient air quality data at Adams Field is presented in Table 10. These ambient levels are influenced by the airport operations as well as emissions from nearby industries. The estimated contributions of the airport to the ambient air quality are 0.10 ug/m^3 of particulates, 0.13 ug/m^3 of sulfur dioxide, 0.77 ug/m^3 of hydrocarbons, and 1.12 ug/m^3 of nitrogen dioxide (Burns and McDonnell Engineering Co., 1980).

The sludge incinerator at the Adams Field Wastewater Treatment Plant (WWTP) is the most critical potential source of air pollutants from the plant. EPA standards for emissions from wastewater treatment plant sludge incinerators (EPA, 1976) require that no air pollutant discharge be made which is:

- in excess of 0.030 grain (weight measure of pollutant) per standard cubic foot of gas
- of 10 percent opacity or greater, unless the presence of uncombined water is the only reason for failure to meet this requirement

The Adams Field WWTP sludge incinerator is reportedly operating well within the limits of its permit. There are usually no visible emissions in violation of the permit except for brief periods following the restart of operations when opacities of 10 percent may be experienced (by telephone, Mr. W. Tolefree, Arkansas Department of Pollution Control &

Table 10

Ambient Air Quality Data at Little Rock

(in ug/m^3)

Year	Total Suspended Particulates Annual Geometric Mean		Sulfur Dioxide Annual Mean		Nitrogen Dioxide Mean
		2nd High		2nd High	
1973	61.61*	116	-	-	-
1974	57.90	130	2.13	20	42.22
1975	58.15	129	1.15	13	32.68
1976	57.85	153*	2.94	20	36.71
1977	65.96*	209*	1.34	14	28.22
1978	64.50*	145	2.28	17	30.98

*Exceeds Secondary standard.

Source: Arkansas Department of Pollution Control and Ecology.

Ecology, April 2, 1981). The sludge incinerator will be abandoned under LRWU's sludge disposal plan.

There were no data available on specific odor conditions at the Adams Field WWTP, but Metroplan and the Arkansas Department of Pollution Control and Ecology have received complaints concerning odors in the area. The odor issue is complicated by the fact that the WWTP is located in an industrial area with several other possible sources of odor, including a nearby meat rendering plant. The differentiation of sources of odor under these circumstances is difficult. The EIS consultants, on a visit to the plant during the very hot summer of 1980, perceived only minor odor problems within the plant site. Odor is subjective and the sensitivity of persons to odor is highly variable.

Odors emanate from wastewater and sludge as a result of partial or incomplete oxidation of the organic material containing sulfur and/or nitrogen in the absence of an oxygen source. The byproducts of such incomplete oxidation are highly odorous gases (such as hydrogen sulfide, methylmercaptans, methylsulfides, indoles and skatoles). Hydrogen sulfide is the most commonly known of the malodorous gases emanating from domestic wastewater collection and treatment systems.

The achievement and maintenance of completely aerobic oxidation of organic matter is basic to odor prevention and control at wastewater facilities. The potential of the various alternatives for achieving this goal is one of the main factors used in rating the alternatives for their odor impacts. There are some wastewater treatment facilities which by their nature are characteristically potential sources of odor. These include sludge beds, wastewater and sludge lagoons, and open wastewater and sludge processing tanks. The inclusion of such facilities in an alternative is another factor used in rating the odor impact of that alternative. Other factors include the overloading of facilities with consequent potential for odor problems associated with inadequate treatment, use of flow equalization to prevent overloading, and the operation of incinerators at high enough temperatures to ensure complete oxidation.

Adams Field Alternatives:

No Action Alternative: Both the liquids and solids handling facilities at the Adams Field WWTP are currently overloaded. The activated sludge reactors, in addition to being overloaded, have been shown to be subject to inefficient oxygen transfer with resulting lower dissolved oxygen levels than required for satisfactory process performance. Continued operation in this manner could represent a significant source of potential odor problems.

Sludge handling facilities such as the gravity thickeners and storage lagoons are also potential sources of odors. The incinerator is another potential source of odor problems because its present operating temperature range of 1200-1500° F (by telephone, Joe Larson, Manager, Adams Field WWTP, March 2, 1981) may not always ensure complete oxidation of organic matter. A minimum temperature of 1400° F is required for complete oxidation and temperature controls should be set to operate between 1550° F and 1600° F to ensure that the desired minimum of 1400° F is achieved throughout all parts of the burning chamber (EPA, 1976). Continued operation under the No Action Alternative, with the above potential sources of odor is likely to result in increasingly worse odor problems. This alternative is rated as adverse.

Upgrading Existing Liquid Treatment Facilities: The planned changes in the activated sludge process (additional aerators, process modifications, better diffusers) should improve the efficiency of the system, and thereby decreases odor potential. The additional settling tanks and equalization tank to correct the existing overload situation should also be beneficial in reducing odor potential. This alternative would have a beneficial impact on air quality.

Fourche Creek Interceptor Alternatives:

Alternative 1: Raw sewage flowing in partially filled gravity sewers of adequate slope is usually suitably oxidized by its contact with air in the sewer to prevent the formation and release of odorous hydrogen sulfide. No significant odor problems would be expected from the gravity interceptor. No adverse impacts on air quality are expected from this alternative.

Alternative 2: Under anaerobic conditions in full flowing force mains (as opposed to partially filled gravity sewers), hydrogen sulfide formation may take place. The sulfide remains dissolved until the pressure in the force main is released at a discharge point such as a manhole or pumping station wet well. Malodorus hydrogen sulfide is then released to the atmosphere unless control measures are effectively implemented. There is a significant potential for adverse odor problems in force main/pumping stations compared with gravity sewers.

Little Maumelle Alternatives:

No significant odor problems have been reported from the current use of on-site systems, mainly septic tank-soil absorption systems (ST-SAS). However, several population clusters have dense septic tank concentrations on unsuitable soils (Freese and Nichols, 1979). Failing soil absorption systems in these clusters could be potential sources of odors, although this has not been documented.

The potential of the various alternatives for achieving complete oxidation of organic matter in wastewater is one of the main criteria used in rating alternatives for their odor impacts. Where on-site soil absorption systems are utilized, the potential for odorous septic effluent to surface at disposal sites is another important criterion. This potential exists where soils are poorly permeable, too steep or too thin, or water tables (seasonal or permanent) are too shallow. Soils exhibiting these conditions are usually classified as having severe limitations for use as soil absorption systems.

No Action Alternative: This alternative would continue the use of septic tank-soil absorption systems (ST-SAS) with little control oversiting of these systems on severely limited soils. Odor problems would likely become significant under these circumstances and this alternative is considered adverse.

Alternatives 1, 2 and 3: These alternatives would utilize soils which are not classified as severely limited for soil absorption systems. The appropriate types of absorption systems (mounds) for varying soil and water table conditions are also proposed. These alternatives should have no significant increase in odor and therefore would have no adverse impact on air quality.

Alternative 4: This alternative proposes the use of a force main to convey sewage from the Little Maumelle watershed to the Arkansas Interceptor and hence to the Adams Field WWTP. Characteristically, full flowing force mains are potentially significant sources of odor problems because of the absence of an oxygen source (air) to oxidize hydrogen sulfide as it is generated in the mains. Unless special odor control measures are implemented at the discharge points of these mains, such as man-holes and pumping station wet wells, significant direct odor problems may arise. Increased emissions of hydrocarbons from automobiles, resulting from induced growth, is considered a slightly adverse indirect long-term impact.

D. SOUND QUALITY

Sound quality in the vicinity of the Adams Field Wastewater Treatment Plant (WWTP) is influenced primarily by aircraft operations at the adjacent Adams Field Airport. Noise contours resulting from existing and future aircraft operations are depicted in Figures 7 and 8, respectively. Ambient noise levels at the plant site range between 65 and 75 L_{dn}. According to the U.S. Environmental Protection Agency's (EPA) classification of noise levels, these ambient levels exceed the classification of "adverse noise impacts exist" range and actually fall in the ranges classified as:

- Significant adverse noise impacts exist: allowable only in unusual cases where lower levels are clearly demonstrated not to be possible (65-70 L_{dn}).
- Levels have unacceptable public health and welfare impacts (70-75 L_{dn}).

The most significant wastewater treatment plant noise emanates from units such as exterior mechanical aerators diffused air blowers with exposed inlets, incinerators, vacuum filters, pumps and electrical generators.

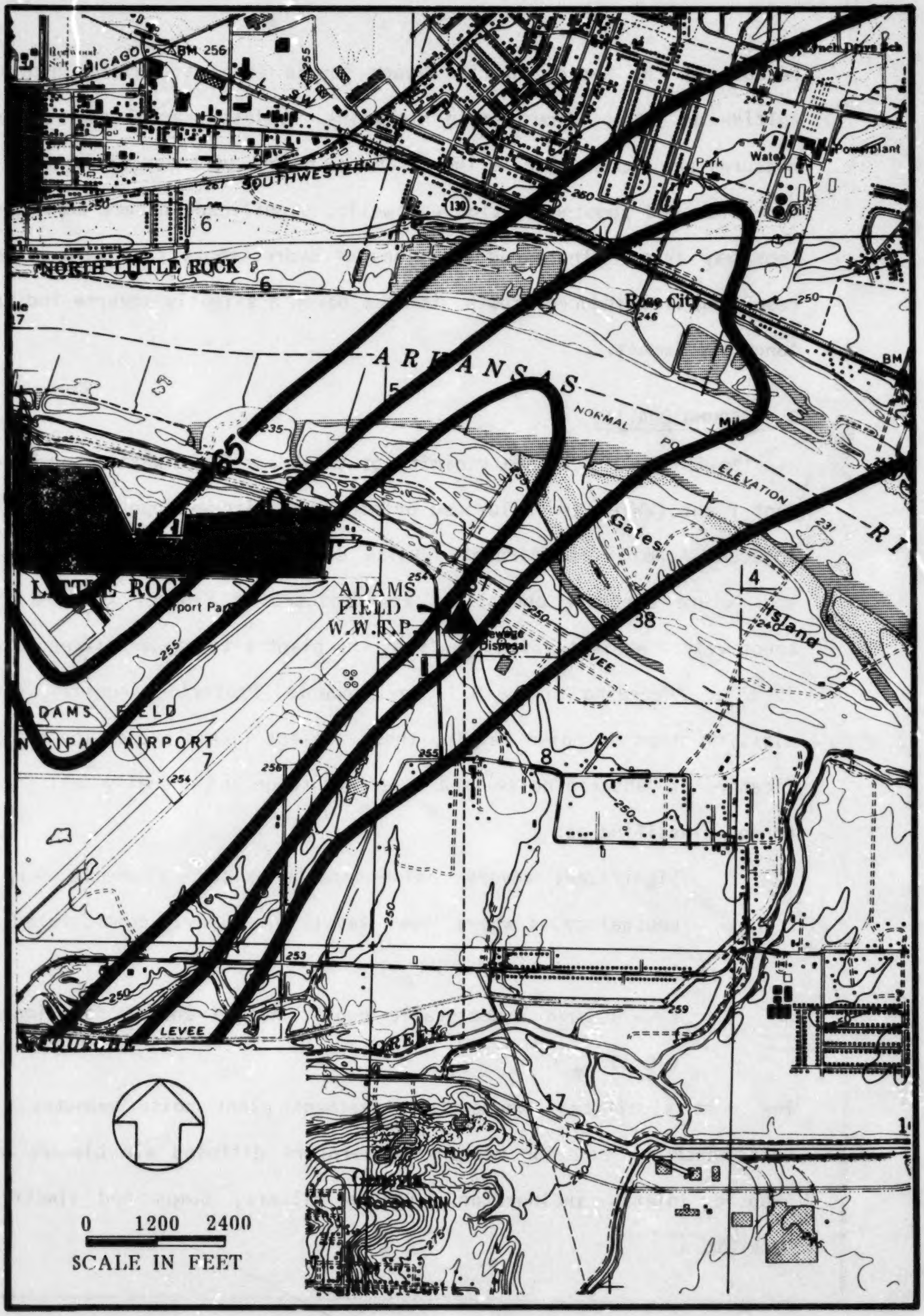

NORTH LITTLE ROCK
LITTLE ROCK
ADAMS FIELD W.W.T.P
ADAMS FIELD MUNICIPAL AIRPORT
ARKANSAS RIVER
NORMAL POOL ELEVATION
65
Rose City
Gates Island
CHICAGO
SOUTHWESTERN
Sewage Disposal
LEVEE
Powerplant
0 1200 2400
SCALE IN FEET

FIGURE 6 EXISTING NOISE CONTOURS AT ADAMS FIELD

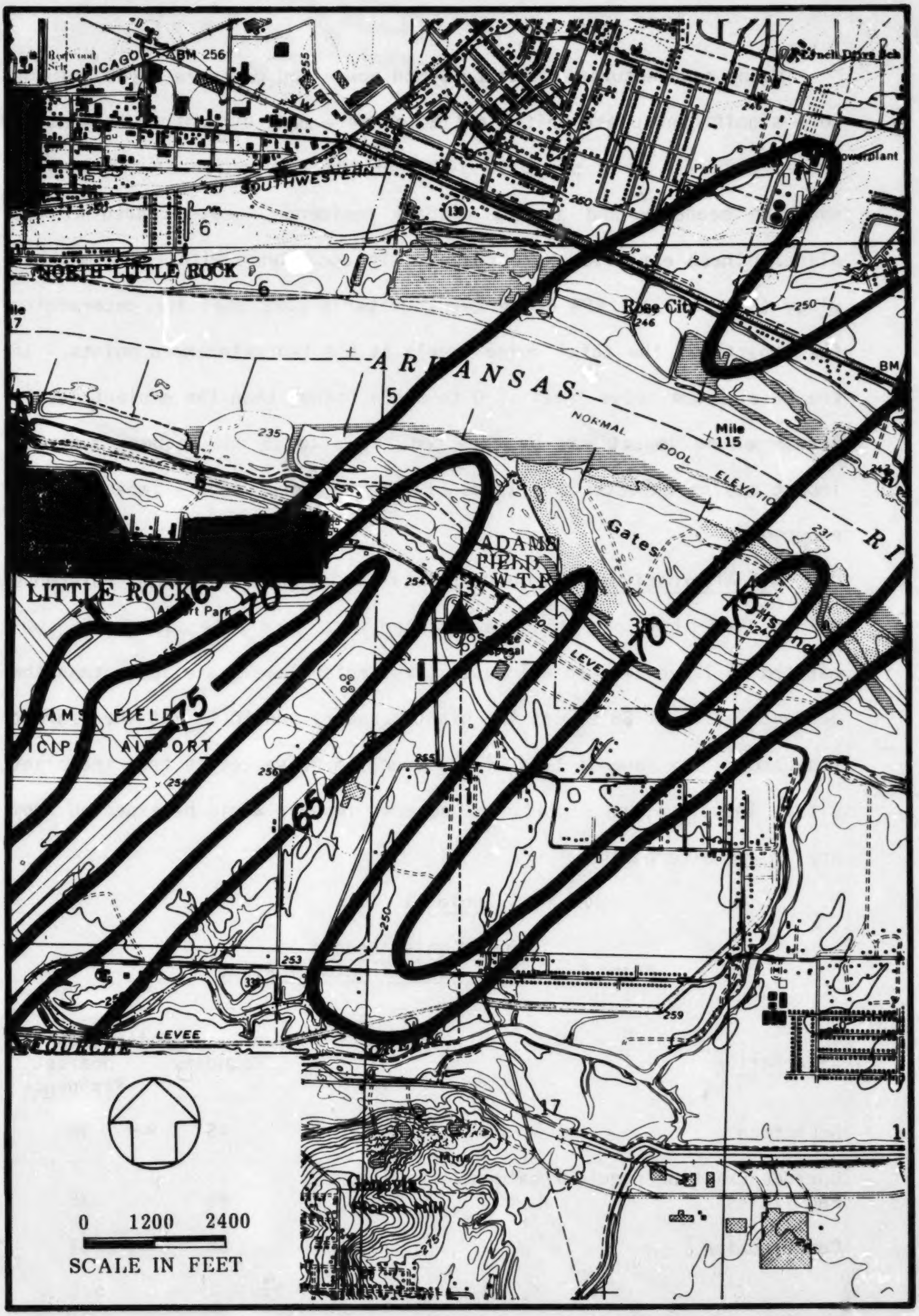

CHICAGO
BM 256
SOUTHWESTERN
NORTH LITTLE ROCK
Rose City
ARKANSAS
NORMAL POOL ELEVATION
Mile 115
Powerplant
ADAMS FIELD
W.W.T.P.
Gates
LITTLE ROCK
LEVEE
ADAMS FIELD
MUNICIPAL AIRPORT
65
70
75
Geneva
0 1200 2400
SCALE IN FEET

FIGURE 7 1995 NOISE CONTOURS AT ADAMS FIELD.

Using manufacturer's data on sound power and pressure levels of the more significant plant units, estimates were made of contributory noise pressure levels at a point 10 feet outside the center of the plant's southern boundary and at the nearest residence located south of the plant. These estimates were computed in accordance with EPA's methodology (EPA, 1976). EPA Noise Level Criteria were used for determining the impacts of the total noise levels at the two referenced points. If the total plant noise level is 0 to 3 dBA higher than the ambient level, little or no impact may be expected; if 3 to 15 dBA higher, moderate impact may be expected; if 15 dBA higher or more, severe impact may be expected.

All Alternatives: Estimated total noise levels at the reference points from plant operations associated with each alternative are summarized in Table 11. In all cases these noise levels are lower than the ambient levels of 68 L_{dn} at the plant boundary and 66 L_{dn} at the nearest residence. The same is true of construction noise levels from the plant site. Therefore, no significant adverse impacts would be expected from any of the alternatives.

Table 11

Estimated Noise Levels
Adams Field Wastewater Treatment Plant

Alternative	Plant Noise (dBA) Boundary	Plant Noise (dBA) Nearest Residence
No Action	45	38
Upgrade Existing Liquid Treatment Facilities	45	38
Construction	58	51

E. BIOLOGICAL ELEMENTS

The proposed alternatives affect three different areas within the Little Rock area. These areas are the Adams Field plant site and vicinity, the Fourche Creek Bottoms along the proposed interceptor route, and the Little Maumelle Valley.

The existing Adams Field treatment plant site is covered with turf grasses (primarily Bermuda and St. Augustine). The lands surrounding the plant site are covered with switchcane, Virginia wild rye, beaked panicum, Switchgrass, bluestems, vines and forbs. To the north and east, cottonwood, sycamore, sweetgum and various oaks can be found. Most of this land has been severely disturbed in past years and the remaining vegetational communities have been altered.

The route of the proposed relief interceptor along Fourche Creek passes through 33,000 feet of the Fourche Bottoms. The Corps of Engineers plans to acquire part of this area and has done a detailed analysis of the vegetation within the Fourche Bottoms. Approximately 14,100 feet of the sewer route would pass through the area known as the Lower Fourche Creek floodplain. Vegetation in this area ranges from high quality wetlands communities of bald cypress, willow, buttonbush, maple, sweetgum, green ash, honey locust, and cottonwood to upland areas of loblolly pine, upland oaks, sweetgum, willow, and upland brush and grasses. In addition to these types are transitional areas ranging from sweetgum, sycamore, elm, pecan, willow oak, and shumard oak to open grasslands and barren areas.

Wildlife living in the woodlands include woodcock, thrushes, wild turkey, vireos, deer, squirrels, and raccoon. Of particular interest as a community are the wetland areas associated with the Fourche Creek

Bottoms. Ducks, geese, rails, beaver, muskrat, and mink are typical examples of wildlife found in these wetland areas.

The upland forest areas in the Little Maumelle area include pine, mixed pine-hardwood, and hardwood associations. Specific associations within these are the Loblolly Pine-Shortleaf Pine (dominant species found in this association are Loblolly Pine, Shortleaf Pine, Sweetgum, Blackgum, Hickory, Hawthorne, Persimmon, Southern Red Oak, and Pot Oak), and Loblolly Pine-Hardwood association (dominant species are Loblolly Pine, Sweetgum, Southern Red Oak, Post Oak, Blackjack Oak, Water Oak, American Elm, Green Ash, and Hickory) and the Shortleaf Pine-Oak association (dominant species found in this association include Shortleaf Pine, White Oak, Black Jack Oak, Black Oak, Post Oak, Southern Red Oak, Hickory, Blackgum, and Sweetgum). Typically, the north facing slopes are cooler and more moist, and support more upland oaks and hickories. On the other hand, the warmer and drier south facing slopes are dominated by Shortleaf Pine.

The Red Maple-Birch-American Elm Sycamore-Cottonwood association occurs in the larger stream valleys of the uplands. These are relatively narrow and well drained, and not subject to prolonged submergence. Similar communities may be found on natural levees or other ridges in the lowland floodplains. The major species of this type, Red Maple, American Elm, Sycamore, River Birch, and Cottonwood often are found in pure stands, not associated with the other major species of the type.

The Arkansas River contains over thirty species of fish with the greatest numbers being bluegills, channel catfish, longear sunfish, freshwater drums, gizzard shad, brook silversides, and miscellaneous shiners (see Working Paper No. 3). While little data is available, the Little Maumelle River most likely contains spotted bass, largemouth bass, crappie, sunfishes, chain pickerel, catfish and shiners. In the upper reaches of the river, fish would be limited to madtoms, minnows and shiners.

Environmentally sensitive areas include floodplains, wetlands, critical habitats for endangered species, and prime farmlands. Floodplains within Little Rock and Pulaski County have been mapped by the Federal Insurance Administration. The Adams Field WWTP does not lie within the 100-year floodplain since it is protected by levee systems. The majority of the Fourche Creek interceptor route lies within the 100-year floodplain. Many of the low lying areas in the Little Maumelle Valley are within the 100-year floodplain.

Wetlands have been identified in both the Fourche Creek Bottoms and Little Maumelle areas. The Fourche Creek Bottoms wetlands are the only ones to be affected by any of the proposed alternatives.

The Arkansas National Heritage Commission and the U.S. Fish and Wildlife Service were contacted to determine if any critical habitats for threatened and endangered species would be affected by the proposed alternatives. There were none identified.

There are a few prime farmland sites (as identified by the Soil Conservation Service) in the Little Maumelle Valley, but none would be affected by any of the proposed alternatives.

Adams Field Alternatives:

No Action Alternative: Since no construction or clearance of land would be required, this alternative would have no adverse impact on terrestrial habitats or environmentally sensitive lands.

The Adams Field WWTP will continue to be overloaded and water quality impact will be adverse. The additional biochemical oxygen demand from the poor quality effluent will be assimilated into the Arkansas River but will temporarily stress aquatic organisms who might enter the discharge plume. Additional bacterial contamination would occur also. This alternative was rated adverse on aquatic life.

Upgrade Liquid Treatment: Since all construction would be on existing property which is presently covered with turf grasses, the impact on terrestrial habitats is minimal. Slight improvements would occur to aquatic life and no adverse impact would result to environmentally sensitive lands.

Fourche Creek Interceptor Alternatives:

Alternative 1: This alternative would require the construction of a 60" gravity sewer through 33,000 feet of the Fourche Creek Bottoms. Excavation would be at least 14-16 feet deep requiring surface cut openings of at least 25 feet in width. Allowing for access for areas that will be under construction, there could be at least a 50-foot wide strip of vegetation cleared for construction. It is estimated that approximately 14 acres of this clearance would be in wetland habitats and 15 acres in upland habitat areas. While 14 acres is not a large area, its affect on the rapidly diminishing wetland resources in the area is considered significant. This alternative was rated as having a highly adverse direct impact on biological resources and environmentally sensitive lands.

The increased capacity of the Fourche Creek interceptor system will allow greater growth in the western portions of the City of Little Rock. This growth, in turn, will result in additional conversion of mixed hardwood-softwood forest to residential and other urban uses. This loss of forest resources, while not significant in light of other available forest habitat, was still considered slightly adverse in regard to long-term biological resources.

Alternative 2: The placement of a force main along the Fourche Creek Bottoms would require less trench depth and more narrow surface cuts than a gravity line. It is estimated that the surface cuts could be as little as 6 feet in width. A construction easement clearance of only 25 feet may be adequate. A force main is more flexible in routing and its actual design may be able to avoid prime wetland areas. As currently planned, this alternative would still require the clearance of 7 acres of wetland vegetation and 7 acres of upland habitat resulting in an inretrievable loss.

An additional impact results from induced growth in the western portions of Little Rock. Continued conversion of forest habitat to residential uses will occur.

Little Maumelle Alternatives:

Alternatives 1, 2, and 3: All of these alternatives would involve installation of individual system on a homeowners lot or a community lot. The amount of clearing of existing terrestrial habitat necessary to install these systems is minimal. There would be no adverse impact on aquatic life.

Alternative 4: Almost all of the proposed lines occur along existing road and railroad rights-of-way. Since little additional clearance of vegetation and habitat would be necessary, this alternative is considered slightly adverse. There would be no adverse impact on aquatic life.

F. SOCIOECONOMICS

Population: The Little Rock/North Little Rock Standard Metropolitan Statistical Area (SMSA) is comprised of Pulaski and Saline Counties. The SMSA includes the Cities of Little Rock, North Little Rock, Jacksonville, Sherwood, Maumelle, Benton and Bryant. Little Rock, the state capital and Pulaski County seat, is the largest city in the state and the only municipality with more than 100,000 in population. Pulaski County contains approximately 15 percent of the state's population while the Little Rock/North Little Rock SMSA contains more than 17 percent of state population.

Population estimates by the Bureau of Census placed the City of Little Rock's population at 141,143 in 1975, an increase of 8,660 persons or 6.5 percent from the 1970 population of 132,483 (see Table 13) (Office of Comprehensive Planning, 1978). This reflects an average annual growth rate of 1.01 percent. The preliminary 1980 census figure for Little Rock was 153,831, and is expected to increase to 215,575 by the year 2000 as shown in Table 12. It should be noted that the final 1980 census figure was 158,461. Pulaski County's population rose from 287,189 in 1970 to an estimated 329,300 in 1978 (Bureau of the Census, 1979), an increase of 14.7 percent from 1970 to 1978. The 1980 preliminary census of the county population was 340,693 with projections placing the 2000 population at 452,885. The final 1980 census population for the county is 340,613. The Little Rock/North Little Rock SMSA grew from a 1970 population of 323,296 to 376,400 by 1978 (Bureau of the Census, 1978), a 16.4 percent increase. The recent census places the preliminary 1980 SMSA population at 393,781.

Table 12

Population Trends and Projections 1950-2000
City, County and Region

	City of Little Rock		Pulaski County		Little Rock SMSA	
Year	Number	Increase Over Previous Decade/%	Number	Increase Over Previous Decade/%	Number	Increase Over Previous Decade/%
1950	102,213		196,685		220,501	
1960	107,813	5,600/5.5	242,980	46,295/23.5	271,936	51,435/23.3
1970	132,483	24,670/22.9	287,189	44,209/18.2	323,296	51,360/18.9
1980	153,831	21,348/16.1	340,693	53,504/18.6	393,781	70,485/21.8
1990	177,185	23,354/15.2	398,190	57,497/16.9	465,100	71,319/18.1
2000	215,574	38,390/21.7	452,885	54,695/13.7	532,140	67,040/14.4

Sources: U.S. Department of Commerce, Bureau of the Census
Metroplan
Little Rock 2000, Little Rock Office of Comprehensive Planning
Wortman and Mann, "Market Study for Maumelle New Community."
Extra Territorial Plan, City of Little Rock, Arkansas, Team Four, Inc.

The facility planning consultant prepared an independent projection of the population which indicated that the City of Little Rock would reach 197,000 people by the year 2000 (AB&H, 1981). However, for planning purposes, they have chosen to utilize the Office of Comprehensive Planning's projection as presented in Table 12. Projected populations were presented by census tract in the Facility Plan, but are summarized by service area in Table 13.

Induced Growth: Secondary growth is the population and land use changes which occur as an indirect result of a given public investment. In the case of sewerage facilities, secondary growth is usually related to the laying of collection lines in areas which have not been developed. The presence of the sewers may induce development which might not otherwise have occurred in the undeveloped land. In the case of the Adams Field WWTP Facility Plan, two components could have secondary growth associated with them. By increasing the capacity of the Fourche Creek interceptor, additional growth can be accommodated in the upper areas of the watershed, primarily along Loop I-430 and along Rock Creek. Second, by providing centralized sewerage collection in the Little Maumelle Valley where none now exists, additional growth may be shifted to this area from other areas in the Little Rock metropolitan region. Secondary growth resulting from the Fourche Creek interceptor expansion was not determined specifically and its impacts were estimated. However, because of the sensitivity and complexity of growth in the Little Maumelle Valley, a computerized growth model was utilized to project growth resulting from each alternative.

The Secondary Growth Model is a tool used to assess the distribution of population growth as a result of siting new sewers. An under-

Table 13

Population Forecast for Service Areas

Area No.	Service Area	1980	1990	2000	2010
I	Adams Field Watershed Sewered	115,385	120,010	125,340	128,860
II	Adams Field Watershed Not Sewered	1,250	4,950	7,400	8,150
III	Eastern Little Maumelle Sewered	5,700	7,500	9,800	11,800
IV	Eastern Little Maumelle Drainage Area Not Sewered	800	1,600	2,000	2,700
V	Fourche Creek Watershed	21,255	0*	0*	0*
	Population Served by Adams Field WWTP	144,390	134,060	144,540	151,510

*South Fourche Plant in Service

lying assumption of the model is that a proposed sewer project will serve as a stimulus to induce growth in the facility's service area. It is also assumed, however, that there are competing areas which have essentially the same characteristics as the proposed service area of the sewer project.

Aerial photography of the City of Little Rock and its surrounding area was used as the major source of geographic information for the growth model. The photography was divided into a grid composed of 16-acre cells, each of which represents a separate parcel of land. All cells which were completely developed were identified and were not considered for additional growth. The physical attributes of the cells in the remaining potential growth area were identified. The following attributes were used:

1. Areas of existing development
2. Drainage characteristics of land
3. Topographical features, wetlands and flood plain areas
4. Surface waters
5. Park land and other controlled acreage
6. Major roads and thoroughfares

The population forecasts, derived from the Facility Plan, were used to define the anticipated growth in the region. The location of sewer lines does not generally influence the growth rate of a city but only the distribution of that growth (Environmental Protection Agency, 1978). The computerized growth model allocates the projected residential growth to the individual cells based upon a development desirability ranking.

The first step in the model was to identify and score each cell, according to a set of criteria relating to potential desirability for development. The criteria consisted of six variables:

1. Access to major thoroughfares
2. Proximity to Central Business District
3. Presence of steep slopes over 25 percent
4. Presence of floodplain
5. Proximity to existing development
6. Presence of sewer connections

Variables one through five were given scores based on a range of 0 to 5, with 5 as the highest or best rank. Variable six received a score of either 0 or 4 with 0 denoting no sewer access and 4 as sewer availability. Scores relating to "access to major thoroughfares," "proximity to existing development," and "proximity to the Central Business District" were determined by cell distance from each mapped factor. Scores for "presence of steep slopes" and "presence of flood plain" were determined through mapping by the amount of area within each cell with such physical characteristics. The total possible desirability score of each cell ranged from a low of 0 to a high of 29.

Multi-family units were assigned a density of 18 units per acre based on a 2.25 persons per household occupancy rate. This allowed for a maximum allocation of 650 persons per cell. Single-family residential land was divided into three categories. Single family units situated on soils unsuitable for septic tanks were assigned a density of 3 units per acre at a ratio of 3.5 persons per household. A total of two single family units per acre at 3.5 persons per household was assigned to cells without sewer service and without soils suitable for septic tanks. This allowed a maximum of 110 persons per cell. If a cell had sewer service access then it was allocated four single family units per acre at 3.5 persons per household for a maximum cell allotment of 225 persons.

The individual cell rankings, in conjunction with the residential density parameters, comprised the data for the Growth Model. The multi-family designator qualifies as the "highest use" of land and, therefore, was allocated its population first to cells with highest desirability. It was assumed that forty percent of the forecast population growth was to be allocated to multi-family housing units. After this forty percent was distributed, the remainder of the population was allocated to single family units.

These data were entered into the Growth Model to examine secondary growth induced under several sewer service alternatives available in the Little Maumelle area. The alternatives analyzed were: (1) the proposed growth and distribution of the forecast population in the absence of additional sewer service (No Action and Alternatives 1-2), (2) the projected growth and distribution of the population if the area containing soils unsuitable for septic tanks was allowed cluster sewer service access (Alternative 3), and (3) the provision of centralized collection and treatment (Alternative 4). The three categories described were computed with the inclusion of the service area of the new Fourche Sewage Treatment Facility. The output of the Growth Model was a listing of cells with population allocation. This resulted in a block of cells which could be plotted to give a graphic display of how the future population growth will be distributed.

Little Maumelle Alternatives:

No Action, Alternatives 1 and 2: Figure 8 shows the population distribution if no or little additional sewerage service were provided to the Little Maumelle Valley. Growth would occur along Highway 10, along Rock Creek, along Loop 430, and in southwest Little Rock. Almost all of the growth in the Maumelle Valley would be within the existing sewered areas. The total population growth in the Maumelle watershed would be 7,347 people.

Alternative 3: Figure 9 shows the population distribution which would occur if cluster systems were provided in areas where soils were unsuitable. This makes some cells slightly more desirable and results in additional growth along Highway 10 in the Little Maumelle Valley. The Maumelle Valley population would increase to 7,887, indicating a secondary growth of 540 persons.

Alternative 4: Figure 10 shows the population distribution which would occur if sewer service were provided to the Little Maumelle Valley. The watershed population would increase by 11,077 persons,

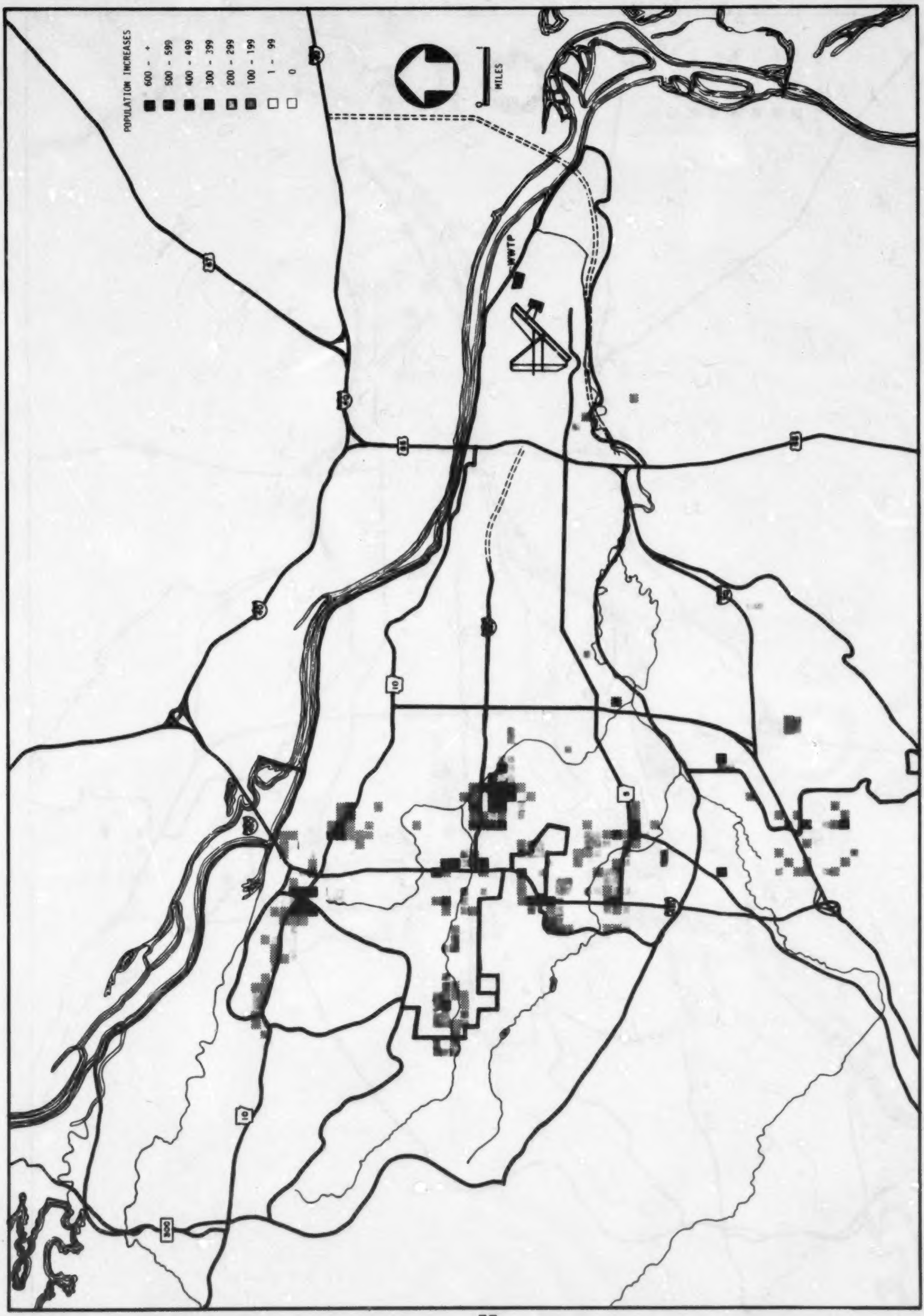
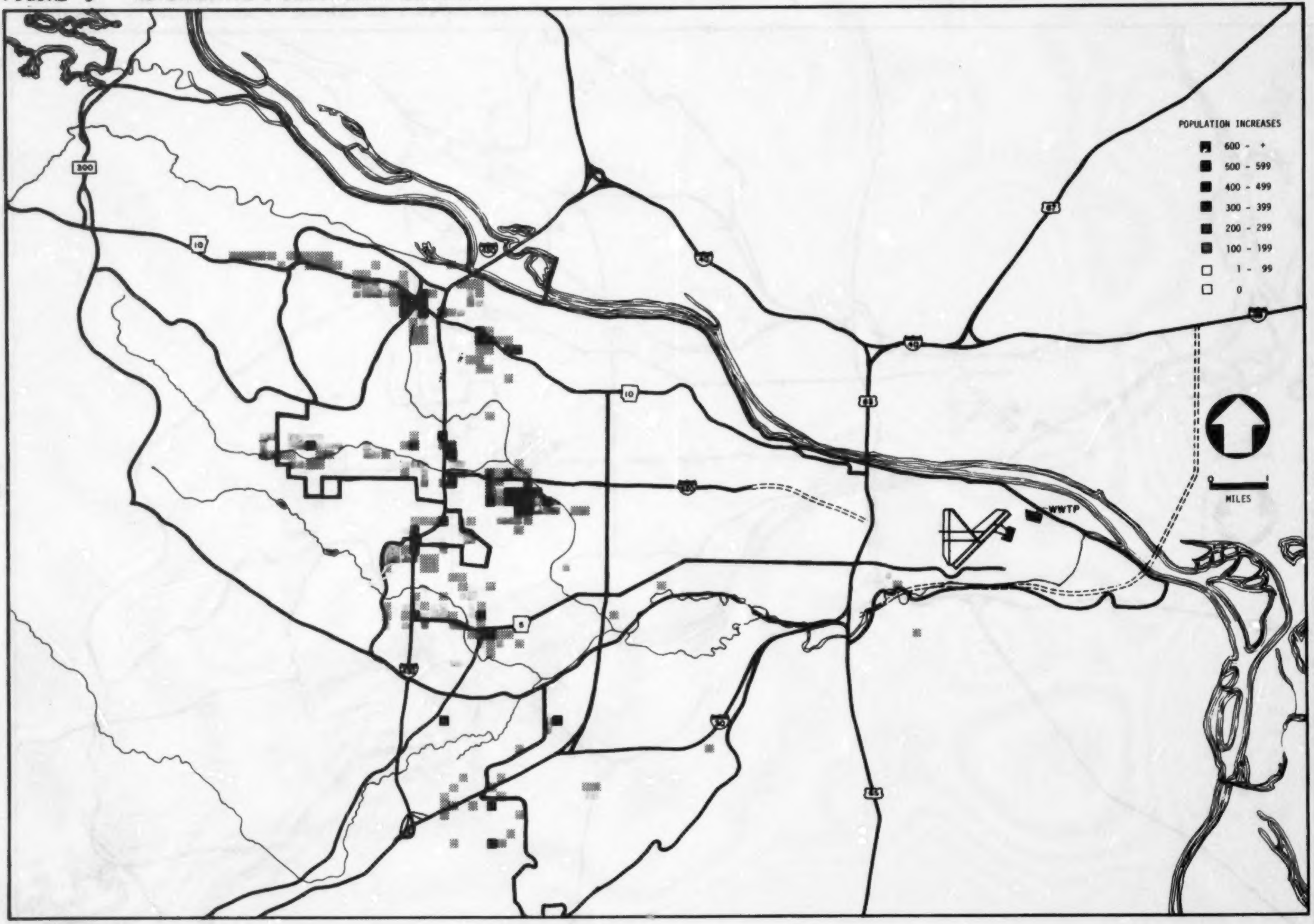

POPULATION INCREASES
600 - +
500 - 599
400 - 499
300 - 399
200 - 299
100 - 199
1 - 99
0
MILES
WWTP
10
10
200

FIGURE 8 NO ACTION, ALTERNATIVE 1 AND 2 SECONDARY GROWTH

FIGURE 9 ALTERNATIVE 3 SECONDARY GROWTH


POPULATION INCREASES
600 - +
500 - 599
400 - 499
300 - 399
200 - 299
100 - 199
1 - 99
0
0
1
MILES
WWTP
300
10
10
5

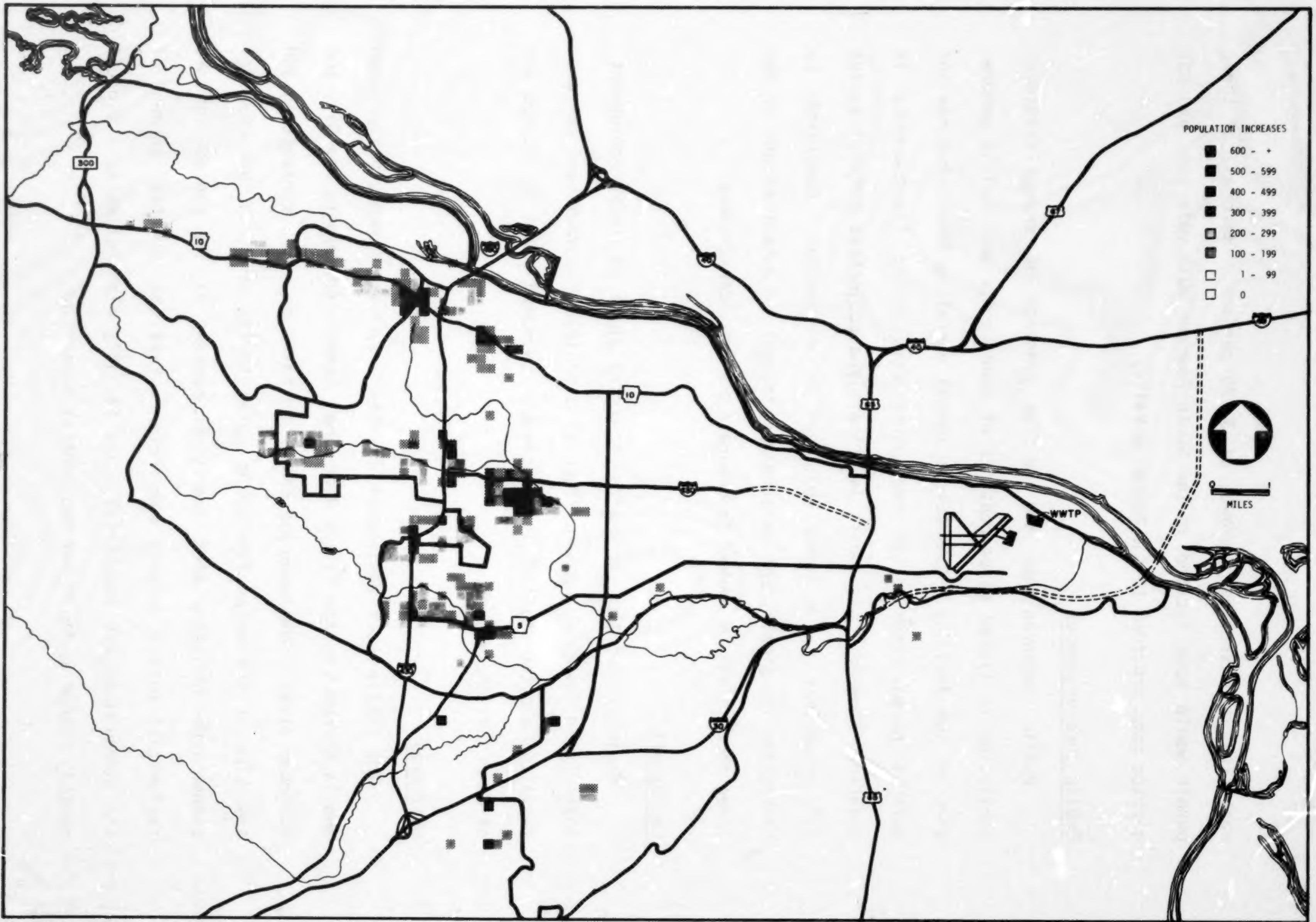

POPULATION INCREASES
■ 600 - +
■ 500 - 599
■ 400 - 499
■ 300 - 399
▨ 200 - 299
▨ 100 - 199
☐ 1 - 99
☐ 0
MILES
WWTP
300
10
10
9

FIGURE 10 ALTERNATIVE 4 SECONDARY GROWTH

resulting in a secondary growth of 3,730 persons. Most all of these people would have located in the South Fourche WWTP watershed had not service been provided in the Maumelle Valley.

Public Inconvenience:

Public inconvenience due to the presence of sewage treatment facilities is linked to perceptions of odor, noise and traffic generation of the facility. Changes in normal operating procedures may interrupt normal routine to the point that public inconvenience is created. However, this impact is primarily a subjective judgment except for situations or episodes that can be documented. Complaints by households or significant measureable changes in output of any of the three factors may be deemed to generate public inconvenience.

Employment:

Municipal service maintains a strong share of local employment. Adams Field Sewage Treatment Plant is a municipally owned and operated facility, and the staff of the wastewater treatment plant is a component of municipal employment.

User Fees:

The Little Rock Wastewater Treatment system is municipally owned and is operated by the Little Rock Sewer Commission serving the City and suburban areas. The sewerage charge is based on water consumption and the size of the meter furnishing water to the unit. A breakdown of connections indicates that nearly 91 percent of the connections are residential with 9 percent commercial. Less than one-half percent of the connections are industrial. The Facility Plan estimates a typical monthly charge as $5.20 per residential connection.

Each of the proposed alternatives for the Adams Field Wastewater Treatment facility will result in an increase to the sewerage costs with resulting needs for increased sewerage charges. The amount of the increase is dependent on the combination of the debt service, grant eligibility, and O&M costs for the alternatives utilized.

An analysis of costs associated with the various alternatives was made for the proposed interceptor and wastewater treatment facilities and then compared to the present sewer charge. The analysis focused on the monthly charge to be assessed each connection and the percent increase over the existing sewer rate that would result from implementing each alternative. The monthly rate was based on the existing rate with the addition of the initial capital cost of the alternative amortized over twenty years. The annual operation and maintenance cost, converted to a monthly charge, was added also. The rate assessment considered using an one hundred percent financial commitment by the City of Little Rock and using a 25 percent participation rate based on 75 percent federal grant.

Recreation:

The City of Little Rock has approximately 38 parks covering more than 3,000 acres. These parks are classified according to size as either metropolitan, community, open space or neighborhood. The outdoor sports of hunting, horseback riding, fishing and other water related activities provide other popular recreational entertainment in the Little Rock area.

Two parks have been proposed for the land on the opposite side of the levee from the Adams Field wastewater treatment plant. These proposed parks include the River Front Park and the Fourche Creek Flood Plain Park System.

Fiscal Balance:

A measurement of the economic viability of a municipality is its ability to balance the costs of operating the community against the revenue generated from the community. Costs include operating expenses and capital outlays either directly incurred or paid to others as a result of specific development. Revenues comprise all monies a municipality receives from external sources as a result of development or redevelopment (Burchell and Listokin, 1978).

The primary means of revenue development in a local economy is through the tax structure. The personal and real property tax of the City of Little Rock is an aggregate of municipal, school and special district taxes. The revenues generated from these levies go to pay for the delivery of municipal services and the support of the local school district system. Increased population has two effects on the fiscal balance of the local economy. The new population will expand the tax base thus increasing the revenues from personal and real property taxes. The new population results also in an increased demand for services which the municipality is to supply. Fiscal imbalance occurs when expenditures for goods and services exceed revenues received for the delivery of these goods and services.

Adams Field Alternatives:

No Action: The No Action Alternative would not alter existing conditions and would not affect public inconvenience. No additional labor requirements would be created. There would be no impact on community services or recreation.

This alternative would have no additional sewer service charges since no construction would be planned. Therefore, this alternative would have no adverse impacts on user fees.

Upgrading Existing Liquid Treatment Facilities: Normal operating conditions and traffic would not be adversely affected by this alternative. The Facility Plan estimates that no additional manpower would be required.

The estimated capital cost of this alternative is $11,052,000. Existing operation and maintenance costs are $1,400,000 and have not been projected by the Facility Plan to increase. At an one hundred percent commitment by the City of Little Rock, the residential wastewater utility customers would pay $1.72 per month in debt service. If the municipality is able to obtain federal participation, the monthly charge for debt service would amount to $0.43 a month per customer. The Facility Plan estimates an increase in sewer charges of about 5 percent under this alternative. There would be no impact on community services or recreation.

Fourche Creek Interceptor Alternatives:

Gravity System: This alternative would not result in any public inconvenience or increased manpower requirement. The gravity system requires an investment of capital of $5,940,000. Annual O&M expenses would be $3,500. User fees assessed residences would amount to $.93 per month per connection under solely municipal financing and $.24 utilizing federal assistance. A positive secondary impact would result from an increased tax base.

Force Main and Pumping Station: Alternative 2 would not result in any public inconvenience or increased manpower requirements. The capital cost of this alternative is $3,792,000 and an annual O&M of $47,300. Residential units would be assessed $.67 a month per connection at an one hundred percent financial participation by the City. If 75 percent federal assistance is obtained then residential rates would fall to $.23 a month per connection. A positive secondary impact would result from an increased tax base.

Little Maumelle Alternatives:

Presently, part of the population residing in the Little Maumelle watershed relies on septic tank systems to satisfy household sewage disposal needs. The user cost of the septic systems are the purchase and installation price and cleaning of the systems performed approximately every three years at an average annual cost of approximately $25 a year.

No Action Alternative: This alternative suggests continuing the present mode of using typical septic tank systems for the treatment of waste. Population growth in the unsewered area of Maumelle would result in an increased number of septic tank systems. However, the only cost is that of installation and an average annual maintenance fee of $25 for cleaning the system. This alternative would have no impact on user fees. There would be no impact on recreation.

Alternative 1: This alternative limits the introduction of new septic tank systems to only areas with suitable soils. Future population growth would then be limited. However, user fees would remain constant with each new system requiring a capital investment of $2,500 and then an average annual O&M of $25. This alternative is rated no impact on user fees. There would be no impact on recreation.

Alternative 2: This alternative assumes that one-half of the anticipated new growth will use conventional septic tank/soil absorption systems. These would be allowable where the soils are capable of absorbing the effluent thus the costs would be the $2,500 installation fee and the $25 average annual O&M charge. The remainder of the anticipated population would have to use mound systems to compensate for the unacceptable soil properties. The mound system would cost each household $5,500 in current dollars. An annual O&M cost would consist of cleaning the septic tank system and maintaining the dosing pumps. The annual O&M calculated for the mound system units would result in a cost of $45, or a monthly fee of $3.75. This alternative would have an adverse impact on user fees due to the high initial capital investment by each homeowner and monthly assessment for annual O&M. There would be no impact on recreation.

Alternative 3: Septic tank systems would serve one-half of the anticipated population growth limited to areas where soils are suitable. This would result in an initial capital investment of $2,500 by each homeowner for the purchase and installation of the septic tank system and an average annual O&M of $25. This annual cost of $25 is for cleaning the septic tank system and is equivalent to a monthly fee of $2.00.

Cluster systems would serve the remainder of new dwelling units built on soils that are not suitable for septic tank absorption fields. This system requires an initial investment in current dollars of $4,291.10 to develop a system of larger septic tanks soil absorption systems located remote from the area. The sewage from each unit would be pumped to these series of common septic tank systems. The initial cost covers the installation of these septic tanks and the pumping units. The annual O&M costs would include the costs of transporting the sewage by pipe and the O&M costs of the individual pumping units. This annual cost is calculated to be $64.74 per unit or a monthly fee of $5.40. This alternative is rated highly adverse for its impact on user fees due to the high initial investment by each homeowner and the high O&M costs. There would be no adverse impact on recreation.

This alternative will induce a population growth of 540 persons to the Little Maumelle watershed. A per capita multiplier was used to assess the effects of the population growth on the fiscal condition of the community. The municipal expenditures for goods and services for the additional population growth would be $81,551. The school district expenditures for the additional student population would be $387,423. Revenues generated from taxes and fees levied would amount to $79,629 for municipal sources and $89,265 for the school district. Municipal expenditures, therefore, would be slightly more than the revenues generated through the new population growth. School district expenditures would far exceed the revenues generated by through the school district tax, thus causing a deficit due to the increased population growth. Total expenditures would be $468,974 with total revenues reaching only $168,894 creating a gap of $300,080. Therefore, this alternative was scored slightly adverse for its impact on the fiscal balance of the local economy.

Alternative 4: This alternative proposes a central collection system in the unsewered portion of the Maumelle watershed discharging to the Arkansas River Interceptor in the Adams Field watershed. The capital cost of this alternative is $4,152,750 with an annual O&M cost of $23,978. The user fees were calculated at a 100 percent financial commitment by the City of Little Rock and on a local-federal share basis with the City of Little Rock contributing 25%. The centralized system results in the financial commitments being borne by all residents of the City of Little Rock and residents in the Maumelle watershed. The 100 percent assumption by the City of Little Rock will produce an addition to the current sewer charge for all city residents of $.64 a month for debt service. Participating in the local-federal share programs reduces the monthly user fee to $.16 a month per connection for construction of the collection system. Users would be assessed normal sewerage charges. This alternative is rated slightly adverse for its impact of increasing existing user fees. There would be little adverse impact on recreation.

This alternative is expected to induce a population growth of 3,730 persons to the Little Maumelle watershed. It advocates using a centralized collection system transmitting the waste to the Adams Field watershed. The induced population growth attributable to this alternative would cost the City of Little Rock an estimated $563,306 for the delivery of municipal services. The return in revenues generated through taxes and fees would amount to $550,024, resulting in a net deficit of $13,082. School district expenditures for the induced student population would be $2,676,091, with revenues from taxes amounting to only $616,592 and a deficit of $2,059,499. Total expenditures for goods and services from the municipality and the school district would equal $3,239,397, with revenues from the induced population growth amounting to $1,166,616 or a net loss of $2,072,781. Therefore, this alternative would create an adverse impact on the fiscal balance of the local economy.

This alternative may also result in public inconvenience. Existing street layouts and traffic patterns reflect a smaller population use. The population growth induced by the implementation of this alternative would increase traffic volumes and alter circulation patterns on the existing transportation system. The increased loads on the system might result in public inconvenience. Therefore, this alternative has an adverse secondary impact on public inconvenience.

Solid Waste Recycling:

Adams Field Alternatives:

No Action Alternative: The present wastewater treatment operation uses incineration for the disposal of sludge. The continuation of this practice offers no resource recovery options. This alternative has been rated highly adverse for its negative impact on recycling or innovative solid waste systems.

Upgrade Existing Liquid Treatment Facilities: This alternative provides only for liquid treatment improvements. It does not present any alternative for sludge disposal. Therefore, it would have no impact on residual waste recycling.

Fourche Creek Interceptor Alternatives:

These alternatives are used only to collect and transport raw sewage. There is no option for recycling or conservation available with these alternatives. Therefore, the interceptor alternatives were rated as having no impact on recycling.

G. ENERGY

The present plant has five blowers capable of blowing air at the rate of 9,000 cfm, each powered with a 450 HP electric motor. Based upon an electricity rate of 5¢/KWH, and the amount of air normally blown, it is estimated that power costs will be approximately $330,000 a year. Additional energy is consumed by the various pumps, vacuum filters, incinerator and lighting facilities at the plant.

Adams Field Alternatives:

No Action Alternative: This alternative would have an adverse impact on energy costs. The present vacuum filters and incinerators are inefficient consumers of a significant amount of energy. The continued use of the filters and incineration result in highly adverse energy impact.

Upgrade Existing Treatment Facility: This alternative results in little change in energy costs experienced by the liquid treatment facilities. The alternative proposes to increase the efficiency of the aeration system blowers, but the increases in energy required to treat the additional wastewater flow will offset these savings. The treatment facility is still a significant consumer of power and, therefore, has a slightly adverse impact on energy usage.

Fourche Creek Interceptor Alternatives:

Gravity Alternative: Gravity flow would use no power for operation. Therefore, it has no impact on energy usage.

Force Main and Pumping Station Alternative: This alternative utilizes a pump station and force main to convey sewage to the Fourche wastewater treatment plant. The energy demands associated with the alternative are significant and represent an increase or addition to present power costs of existing plant operation. Therefore, this alternative is considered slightly adverse.

Little Maumelle Alternatives:

Alternatives 1 and 2: These alternatives rely on septic tank/soil absorption systems to satisfy sewage disposal. There are no energy requirements for most septic tank systems. These two alternatives would have no adverse impact on energy.

Alternative 2 and 3: These two alternatives utilize dosing pumps for the cluster or mound systems. The pumps consume energy at the rate of approximately 7 kilowatt hours per capita per year. Based on an energy cost of 5¢/kilowatt hour, the energy cost would be 35¢ per person per year. The population absorbing this cost is anticipated to be approximately 949 persons. This represents an annual power cost of $332.15. Energy costs per household, however, are not very significant. These alternatives will have little impact on energy.

Alternative 4: This alternative utilizes a centralized collection system and transmits the collected wastewater to the Arkansas Interceptor to Adams Field. The energy cost associated with this method is estimated to be 32.4 kilowatt hours per capita per year. This cost would be borne by each household in the area. Based on a price of 5¢ per kilowatt hour, the energy cost would be $1.62 per person per year. The anticipated population of the area is 2,700 which results in an annual energy cost of $4,374 associated with this alternative. Therefore, this impact is slightly adverse on energy usage.

There will be a energy consumption increase as a result of increased population; however, it will not increase to a significant degree.

H. LAND USE:

Land uses adjacent to the Adams Field Wastewater Treatment Plant include public, open and agricultural uses (see Figure 11). The treatment plant is bounded on the north by the levee of the Arkansas River. On the opposite side of the levee, the land is cleared but generally unused. A large area of open forest and agricultural land is located on Gates Island, along the south shore of the river. Along the northern shore of the river, land is also undeveloped but residential areas are found along and to the north of State Highway 130. To the east and south of the plant site, the land has been used for agricultural and pasture with some scattered residential area along Fourche Dam Pike. The treatment plant is bound on the west by East 9th Street which terminates into the Airport access road and Fourche Dam Pike about 2,000 feet south of the entrance to the treatment plant. The main terminal for the airport is located approximately 2,000 feet to the southwest of the wastewater treatment plant. North of the treatment plant is another residential area; however, a meat rendering plant lies on the eastern edge of the settlement.

The low lying land along Fourche Creek and its tributaries has been designated as flood plain. Flood plain land occupies approximately 16.9 square miles. Fourche Creek bounds an industrial district on the north. To the east and south of Fourche Creek is Interstate 30 and Patterson Road lies on the west.

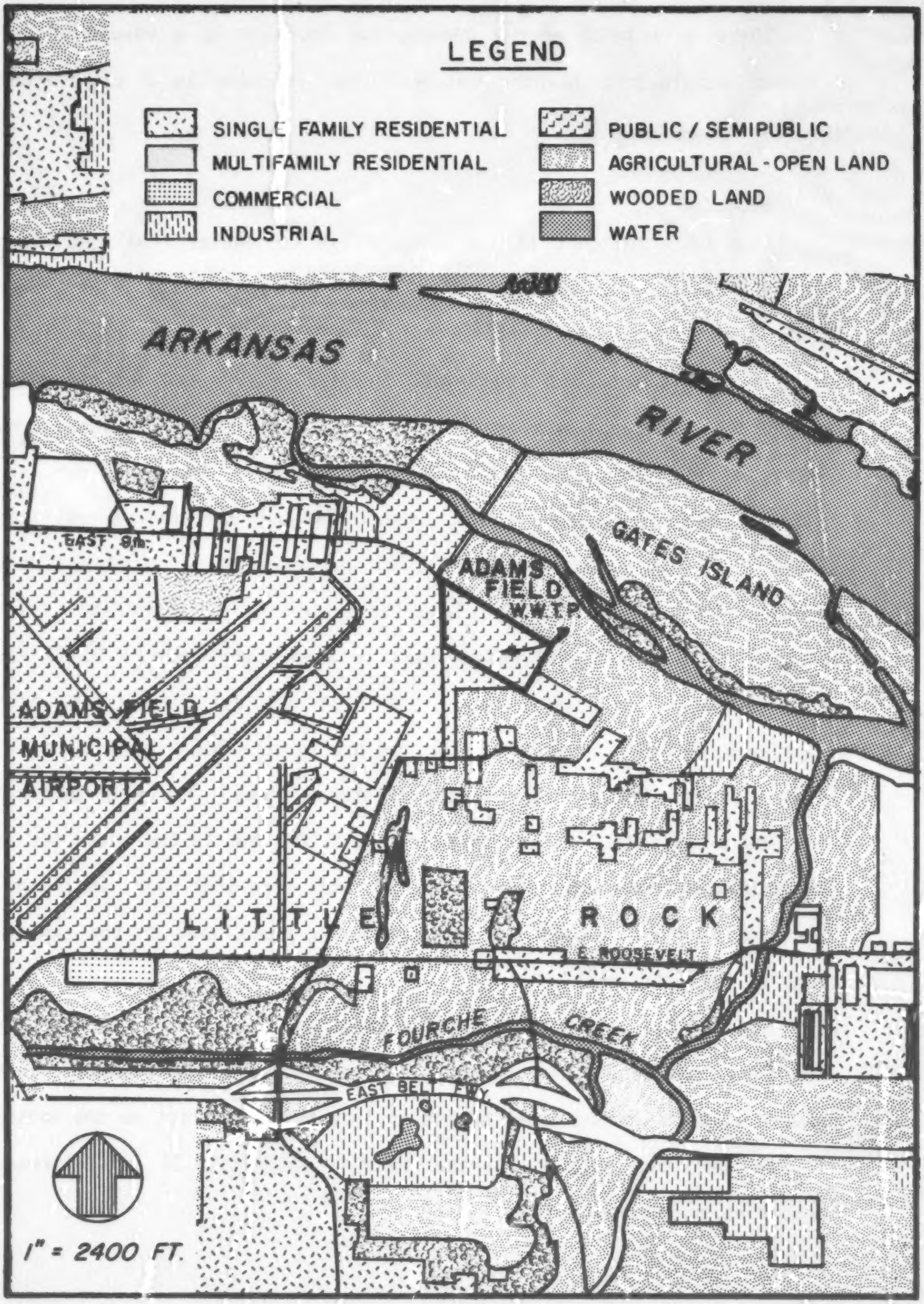
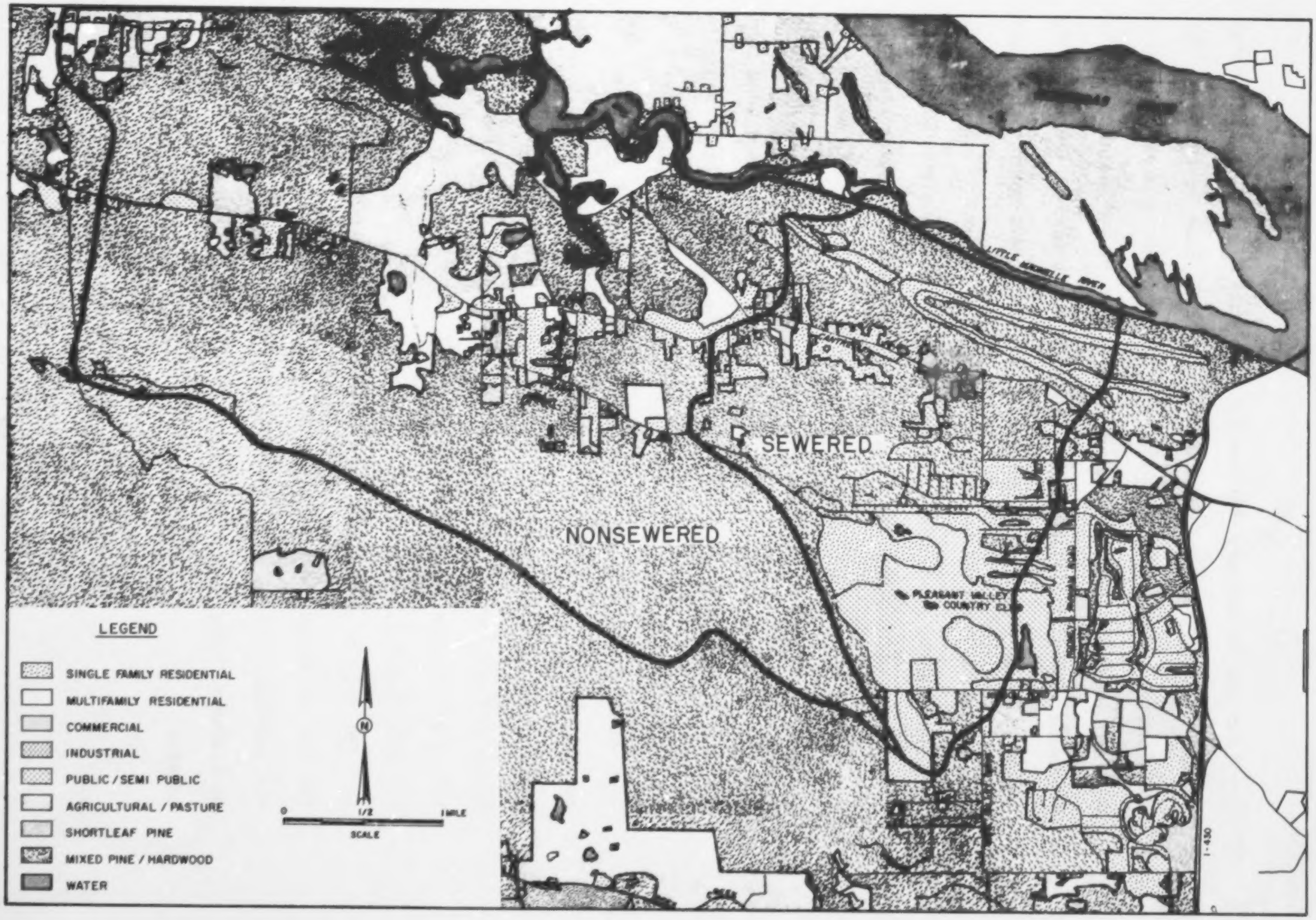

LEGEND
SINGLE FAMILY RESIDENTIAL
MULTIFAMILY RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC / SEMIPUBLIC
AGRICULTURAL - OPEN LAND
WOODED LAND
WATER
ARKANSAS
RIVER
GATES ISLAND
ADAMS FIELD W.W.T.P.
EAST 9th
ADAMS FIELD MUNICIPAL AIRPORT
LITTLE ROCK
E. ROOSEVELT
FOURCHE CREEK
EAST BELT FWY
1" = 2400 FT.

FIGURE 11 LAND USE MAP OF ADAMS FIELD DETAILED STUDY AREA.

Land use in the West-Northwest Little Rock (Little Maumelle) area is dominated by forest land (see Figure 12). Some residential subdivisions have been constructed in the Pleasant Valley area, including Woodland Heights, Longlea, Marlow Manor, and Pebble Beach, and the Birchwood subdivision along West Markham and Kanis Roads. The remaining residential development is scattered and strip development along the more important roads in the area, particularly Highway 10, Kanis Road, and Colonel Glenn Road. Some of the more notable communities which have grown along these roads are Pankey, Ivesville, and the Taylor Loop Road area along Highway 10, Shady Grove along Kanis Road, and Martindale along Colonel Glenn Road. Some scattered areas in the valleys have been cleared for pasture and several small lakes and ponds have been constructed along the creeks. North of Highway 10, the Little Maumelle River flows in a west to east direction. To the north of the river is a flat strip of land along the Arkansas River which has been used for agriculture and a penal farm. There are also some boat marinas and landings in this area for recreational and fishing activities in the Arkansas River and the lower Little Maumelle River. To the northwest of this area are the Maumelle Pennacles, much of which is included in the Pinnacle Mountain State Park.

The City of Little Rock has developed a Suburban Development plan for the surrounding area undergoing urbanization. This plan is a guide for potential development and indicates compatible land uses for future development. The plan represents a move toward planned and controlled growth.

FIGURE 12 LAND USE MAP OF WEST-NORTHWEST LITTLE ROCK


LITTLE MAUMELLE RIVER
SEWERED
NONSEWERED
PLEASANT VALLEY COUNTRY CL.
I-430
LEGEND
SINGLE FAMILY RESIDENTIAL
MULTIFAMILY RESIDENTIAL
COMMERCIAL
INDUSTRIAL
PUBLIC / SEMI PUBLIC
AGRICULTURAL / PASTURE
SHORTLEAF PINE
MIXED PINE / HARDWOOD
WATER
N
0
1/2
1 MILE
SCALE

Adams Field Alternatives:

No Action Alternative: This alternative will not alter any existing land use; therefore, it will have no impact on land use.

Upgrade Existing Facility: This alternative should not require any changes in surrounding land use. Therefore, this alternative will have no direct adverse impact on land use. There will be no adverse or beneficial secondary land use impacts.

Fourche Creek Interceptor Alternatives:

These alternatives will not affect existing land use patterns, and therefore would have no adverse land use impact.

Little Maumelle Alternatives:

Alternatives 1, & 2: These alternatives will not affect existing land use within the area. Therefore, these alternatives have no direct adverse impact on land use.

Alternative 3: This alternative proposes the use of cluster systems for approximately one-half of the anticipated population growth. These cluster systems would require 10 acres of land for absorption fields. This land would be remote from the area of development in soils that would be suitable for the conventional septic tank system. This alternative would have an adverse impact by altering existing land use patterns.

Alternative 4: The City of Little Rock Suburban Development Plan had not designated residential land uses for the areas that would be converted for such use in the Little Maumelle area as a result of the implementation of this alternative. Since the population growth that would occur as a result of the alternative and its consumption of land do not reflect the planned land use indicated by the Suburban Development Plan, this alternative has been rated adverse for its secondary impact on land use.

I. ARCHAEOLOGICAL AND HISTORICAL RESOURCES:

The Arkansas Archaeological Survey and the Arkansas Historic Preservation Program have been contacted regarding the project. Due to the variety of potential sites, an inventory has been postponed pending definitive alternative selection. It is anticipated that the archeological survey work will be completed and coordinated with the State Historic Preservation Officer after the detailed design of the facilities is available and before construction begins. The pertinent correspondence has been included in the coordination chapter.

J. PUBLIC HEALTH:

Currently, the wastewater treatment operations by the City of Little Rock are not adequately treating the sewage. The present capacity of the treatment plant is not adequate which results in the raw sewage not being treated properly and effluent quality problems. At flows greater than design, the settling basin becomes less efficient operating at or below normal efficiency levels. At present, there are six aeration basins which have with the associated piping a hydraulic capacity that is less than necessary to treat peak flows. Inadequately treated sewage may pose health hazards by creating conditions which may foster the development of diseases and infections.

The majority of the soils of the Little Maumelle watershed are unsuitable for septic tank systems. If septic tank units were installed in these areas, the potential for failures is heightened and public health endangered. The conveyance of sewage for treatment must be conducted in a safe and sanitary manner if public health hazards are to be avoided.

Adams Field Alternatives:

No Action Alternative: Present operating conditions have been found to result in the discharge of inadequately treated sewage to the Arkansas River. Therefore, this alternative fosters a situation in which public health may be adversely endangered. This alternative is considered to have an adverse impact on public health.

All Other Adams Field Alternatives: It is assumed that the remaining alternatives proposed will function properly to adequately treat the wastewater and that proper disposal of residual waste will take place. Therefore, these alternatives would not have an adverse direct impact on public health.

Little Maumelle Alternatives:

No Action Alternative: This alternative would allow the continued use of septic tank systems in the Little Maumelle area with insufficient controls over the siting of septic tanks on unsuitable soils. The potential for septic tank failures would be enhanced, resulting in an adverse impact on public health.

All Other Alternatives: It is assumed that the design and control measures proposed by each of these alternatives will function properly. Wastewater would be adequately treated and disposed such that public health would be protected. Therefore, these alternatives would have little adverse impact on public health.

V. COORDINATION:

In November 1979, the Little Rock Wastewater Utility designated a Citizens Advisory Committee to serve as the major public interface with the facility planning and the accompanying environmental impact statement processes. In accordance with guidance and regulations of the Environmental Protection Agency, a balanced membership of persons representing elected and appointed officials, of public interest groups, private citizens, and economic or special interests was appointed to the Committee. The people currently serving in each of these categories are:

Public Interest

Paul Butt, Arkansas Ecology Center

Becky Harris, Community Action for Maumelle Preservation (CAMP)

Officials

Lottie Shackleford, Little Rock City Director

Joe Kaufman, Chairman, Pulaski County Planning Board

Private Citizens

Richard Baldauf, Museum of Science and History

Gerald Hanson, UALR Geography Department

Special or Economic Interest

William Hastings, Rector, Phillips, and Morse

Don E. Bone, Arkansas Power and Light

Nolan Fleming, Greater Little Rock Chamber of Commerce (former member)

Wieble Alley, Arkansas Power and Light (former member)

Metroplan, the local council of governments, was contracted to coordinate public participation on the project.

On March 10, 1980, a public meeting was held to receive public comment on isses pertaining to the EIS on expansion of the Adams Field WWTP. The meeting was well attended but most of the speakers were primarily concerned with the proposed 208 Plan for the Little Rock-North Little Rock region rather than the specific issues pertaining to the proposed Adams Field expansion. The concerns raised over centralized treatment systems in low density areas, however, do have bearing on the proposed project.

During the course of the project, the Citizens Advisory Committee reviewed all interim documents and meetings were held at the conclusion of major tasks. The Citizens Advisory Committee provided major input on developing weights for each environmental parameter. The Citizens Advisory Committee has endorsed the findings of the EIS, with the exception of preferring the gravity line alternative for the Fourche Creek interceptor. The gravity line was favored because of its lower operation and maintenance cost and energy requirements.

Over the course of the project, numerous public and private agencies were contacted for infomation and comment. These include Little Rock Department of Comprehensive Planning, Little Rock District of the Army Corps of Engineers, Arkansas Employment Security Division, Metroplan, Arkansas Department of Health, Arkansas Game & Fish Commission, Arkansas Department of Pollution Control & Ecology, Pulaski County Health Department, Arkansas Natural Heritage Commission, Arkansas Department of Natural and Cultural Heritage, Arkansas Ecology Center, the Nature Conservancy, Arkansas Natural and Scenic Rivers Commission, Arkansas State Highway and Transportation Department, Arkansas Archeological Survey, Little Rock Airport Commission, and the U.S. Fish and

Wildlife Service. Some of the pertinent correspondence from these contacts are included in the following pages.

PRESERVING THE PAST FOR THE FUTURE

ARKANSAS ARCHEOLOGICAL SURVEY

Director · Charles R. McGimsey III
State Archeologist · Hester A. Davis

[illegible] Box R
[illegible]
Fayetteville, Arkansas 72701

July 10, 1980

Mr. David R. Gattis
Freese and Nichols, Inc.
811 Lamar Street
Fort Worth, TX 76102

Re: Adam's Field EIS

Dear Mr. Gattis:

Thank you for notifying me of the future plans to expand the Adam's Field wastewater treatment plant. I hope that the following information will be of help in the planning process.

One archeological site (3PU55) is located south of the existing plant site and is within the project area as designated in Attachment 2 of your June 24 correspondence. There have been no archeological sites recorded for the study areas shown in red on Attachment 1.

In answer to your request regarding archeological site potential, I would designate all areas along the Arkansas River as high potential areas. Floodplains and terraces along the many intermittent streams and ridgetops have moderate to high potential, while steep slopes are low potential areas for the presence of archeological sites.

Treatment plant expansion or sewer line construction should not begin until adequate archeological work has been completed. Such work should include a complete archeological survey of the areas to be affected, including an assessment of the archeological sites discovered. If construction is planned that will affect site 3PU55, then that site will also have to be assessed for archeological significance.

Please notify me when alternative plans for the plant expansion and sewer line work are more formalized.

Sincerely,

Hester A. Davis/lcm

Hester A. Davis
State Archeologist

HAD/lcm
cc: State Historic Preservation Officer
Skip Stewart-Abernathy

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ARKANSAS HISTORIC PRESERVATION PROGRAM
Suite 500, Continental Building · Markham and Main · Little Rock, Arkansas 72201
Phone (501) 371-2763

August 28, 1980

Mr. David R. Gattis
Freese & Nichols, Inc.
811 Lamar Street
Fort Worth, Texas 76102

Re: Adams Field Wastewater Plant
Environmental Impact Statement
Little Rock, Arkansas, Pulaski Co.

Dear Mr. Gattis:

Thank you for your inquiry as to historic resources in the special study areas indicated in your correspondence of August 25, 1980. Our historic-resources inventory lists no properties for these areas. However, the inventory is not complete; it is possible that resources are there.

My comment does not cover archeology. If you have not already done so, you should contact Ms. Hester Davis, the State Archeologist for comments on the presence of archeological resources. Ms. Davis's address is P.O. Box R, Fayetteville 72701.

I look forward to hearing from you as plans are refined further. Please contact Jack Doss of my staff (501-371-2763) if we can assist you further.

Sincerely,

Joan Baldridge

Joan Williams Baldridge
State Historic Preservation Officer

JWB/JD/kt

cc: Hester Davis

A Division of the Department of Natural & Cultural Heritage
An Equal Opportunity Employer

ARKANSAS NATURAL HERITAGE COMMISSION
SUITE 500, CONTINENTAL BUILDING
MAIN AND MARKHAM
LITTLE ROCK, ARKANSAS 72201

September 24, 1980
today's date

TO: Mr. David R. Gattis
Freese and Nichols, Inc.
811 Lamar Street
Fort Worth, Texas 76102

FROM: Bill Shepherd
name
Inventory Manager
title
WmS
initials
(for Harold K. Grimmett,
Executive Director)

A NOTE ABOUT THIS FORM: The Natural Heritage Commission receives large numbers of environmental documents for review and requests for information. The staff that handles these is small and carries other responsibilities as well. Pressure of work makes it necessary that responses be rendered in a manner as time-efficient as possible. Thus this form (instead of a letter). We hope it helps us respond more promptly. Your patience and understanding are solicited.

The Arkansas Natural Heritage Commission acknowledges receipt of your

☒ inquiry concerning overall planning area for Little Rock Wastewater Utility's proposed expansion of Adams Field treatment plant

☐ environmental statement titled ______
and dated ______

The Arkansas Natural Heritage Commission has

☐ no information of the type requested

☐ no specific information about the site or sites in question
(other than that given below and/or in the material attached to this form).

☒ See attachment(s). Your reduced copies of quad sheets returned herewith, locations of element occurrences shown thereon.

Please address any further inquiry to Bill Shepherd
at the address above or at (501) 371-1706.

Space for additional message:

As far as we can determine, none of the element occurrences shown would be affected by the proposed expansion of the Adams Field treatment plant.

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FUTURE

ARKANSAS ARCHEOLOGICAL SURVEY

Office of State Archeologist

P.O. Box R
Fayetteville, AR 72701
Phone: 501-575-3556

April 6, 1981

Mr. David R. Gattis
Freese and Nichols, Inc.
811 Lamar Street
Fort Worth, TX 76102

Re: Adams Field Wastewater Treatment Plant EIS

Dear Mr. Gattis:

Since my last correspondence with you on July 10, 1980, there have been several archeological sites recorded in the Little Rock area, some of which may be affected by the Adams Field wastewater project. Below is a discussion of each project area and the archeological sites and archeological potential.

Attachment 1: There are two sites that border or are within the project boundary as designated. Site 3PU55 is an important protohistoric Quapaw phase archeological site. Many artifacts have been collected from this site in the past, mostly by local amateurs. Site 3PU182 is a historic site which dates from approximately the midnineteenth century to the 1930s. A field investigation of the project area as shown on Attachment 1 will be necessary to determine what effects the project will have on these sites.

Attachment 2: No known archeological sites have been recorded in this area. There is, however, a recorded site approximately one-quarter of a mile west. No systematic archeological investigations have been conducted of the project area. The location along the Arkansas River channel and the proximity to a known site make this a high potential area for the presence of archeological resources. I recommend that a systematic archeological investigation be conducted within the project area.

Attachment 3: One archeological site, 3PU194, has been recorded on one of the proposed wastewater lines. Both prehistoric and historic artifacts have been discovered on this site. The potential for discovering other sites along the routes as indicated in red is high, particularly where these lines follow or cross streams. The level of archeological work for areas included on this map is dependent on how close the lines will follow existing roads and the railroad grade. According to the quad map, some of the line locations do not follow existing roads. These areas should definitely be surveyed by a professional archeologist prior to construction.

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If you have any questions regarding the recommendations included in this letter, please notify me. I would strongly recommend that the necessary field investigations be initiated early in the planning process.

Sincerely,

Hester A. Davis
State Archeologist

HAD/lcm
cc: State Historic Preservation Officer
Skip Stewart-Abernathy
Martha Rolingson

ARKANSAS HISTORIC PRESERVATION PROGRAM
Suite 500, Continental Building · Markham and Main · Little Rock, Arkansas 72201 Phone (501) 371-2763

April 14, 1981

Mr. David R. Gattis
Freese and Nichols, Inc.
811 Lamar Street
Fort Worth, Texas 76102

Re: Adams Field Wastewater Treatment
Plant EIS, Little Rock, Pulaski Co.

Dear Mr. Gattis:

This letter is written in response to your inquiry of March 24, 1981, regarding properties of architectural and historical significance in the area of the proposed above referenced project.

The professional staff of the Arkansas Historic Preservation Program has reviewed the available material which pertains to the area in question. The staff of the Historic Preservation Program has reported that the proposed project will not affect any property of architectural or historic significance.

A field survey of the affected area to locate properties of historic and/or architectural significance will not be required. Archeological clearance from our program must come through Ms. Hester Davis, State Archeologist, P.O. Box R, Fayetteville, Arkansas 72701.

If we can be of further assistance please contact Robert Hughes of my staff at (501) 371-2763.

Sincerely,

Barbara W. Heffington
for
Joan Williams Baldridge
State Historic Preservation Officer

JWB/RH/fb

cc: Hester Davis

A Division of the Department of Natural & Cultural Heritage
An Equal Opportunity Employer

List of Preparers

Mr. Mack S. Barber was the project manager for this assignment. A math/physics graduate from the University of South Florida, Mr. Barber has over 10 years experience in regional planning, environemental planning, estuary study and deep ocean study. In the past five years he has been responsible for several environmental and regional planning project which included multifaceted studies involving wastewater management planning and the associated environmental assessments of these plans. For the last three years he has led a multi-disciplinary team including engineers, planners, technicians and draftsmen on numerous wastewater management problems including two for the Little Rock area. His responsibilities have included extensive client coordination and responsibility for the presentation of the findings of these studies in over twenty public participation meetings in addition his normal project supervision responsibilities.

Senior environmental planner for the project was David R. Gattis. Mr. Gattis studied environmental science and urban affairs at Texas Christian University. He has seven years of professional experience in environmental planning and the preparation of environmental impact assessments. He has assumed major responsibility for the technical direction of approximately 25 environmental studies, including preparation of the environmental impact statements for the operation of 23 military facilities in Texas, environmental assessments for Step 1 Facility Planning for Wastewater Treatment Facilities, and Section 208 areawide wastewater management plans. Mr. Gattis began his work in the Little Rock area in 1977 and has participated in three major studies in Arkansas.

Ulrich P. Gibson, P.E., served as senior project engineer for the EIS. Mr. Gibson has more than 22-years experience in environemental engineering work. He has 17 years management experience in environmental planning, water resources, sanitary engineering, hydrogeology and ground water development. He has 3 years of consulting experience as Project Leader on Environmental Impact Statements and other technical studies related to the National Environmental Policy Act and other pertinent acts. He has managed a staff of 1,200 engaged in carrying out a $500 million water resources program. Mr. Gibson has a bachelor's degree in civil engineering from the University of Edinburgh, and master's in Public Health Engineering and doctorate in Environmental Health Engineering from the University of Minnesota.

Lauren Phillips served as environmental scientist for this project. For the past three years Miss Phillips has been involed in various disciplines within the environmental science field including biology, microbiology, ecology, wastewater treatment, physical geography and environmental health. She has conducted biological studies and prepared environmental impact statements and assessments for a variety of projects. Miss Phillips has a bachelor's degree in environmental science biology from Washington and Jefferson College, prior to joing C. C. Johnson and Associates, she was an instructor in the Environmental Science and Technology Department at the Pittsburgh Technical Institute.

Karen W. Williams was the environmental planner for economics for the EIS. Ms. Williams earned bachelor's degrees in urban affairs and economics and a master's in economics from Texas Christian University. Her past project experience includes population and land use projections and municipal and industrial inventory for studies in Arkansas and Texas. She is the planner in charge of Historical/Archeological Analysis Review for all Freese and Nichols projects.

REFERENCES

Alvord, Burdick, Howson, 1981, Adams Field Sewage Facility Plan, for Little Rock Wastewater Utility in Little Rock, Arkansas, Chicago, Illinois.

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Freese and Nichols, Inc., 1980, Environmental Impact Working Paper No. 3, Environmental Setting for Adams Field Wastewater Treatment Plant, for Little Rock Wastewater Utility and U.S. EPA, Fort Worth, Texas.

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METRIC CONVERSION TABLE

To Convert From	To	Multiply by
Acre	Hectare	0.4046873
Cubic feet per second (cfs)	Cubic meter per second (cms)	2.831685×10^{-2}
Feet	Meters	3.048×10^{-1}
Gallon	Cubic meter (m^3)	4.546092×10^{-3}
Horsepower (hp)	Watts	746
Inch	Centimeter	2.54
Kilowatt hour	Joule	3.60×10^{6}
Miles	Kilometers	1.609347
Pounds (lbs.)	Kilograms	0.4535924
Square miles	Hectares	258.9998
Tons	Kilograms	907.1847

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